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121 ***Fourteenth World Health Assembly—1***

126 ***Address by the Honourable Mr Jawaharlal Nehru***

128 ***Chemotherapy of malaria***

133 ***Notifiable diseases in the Americas, 1949-1958***

141 ***Genetic studies of Aëdes aegypti***

144 ***International work in cholera—4***

151 ***Periodontal disease***

155 ***Nursing in the Eastern Mediterranean Region***

157 ***Notes and news***

161 ***People and places***

WORLD HEALTH ORGANIZATION

In this issue

- *The Fourteenth World Health Assembly, which met at Vigyan Bhavan, New Delhi, India, in February 1961, was the first to be held in the continent of Asia. Addressing the Assembly, the Honourable Mr Jawaharlal Nehru, Prime Minister of India, Dr Arcot Lakshmanaswami Mudaliar, President of the Assembly, Dr Marcolino G. Candau, Director-General of WHO, and Mr S. M. Keeny, Director of the Asia Regional Office of UNICEF, representing Mr Dag Hammarskjöld, Secretary-General of the United Nations, all spoke of the growing responsibilities of WHO, particularly in the young countries, 17 of which in Africa alone had achieved independence in 1960 (see pages 121-128).*

- *Recent studies of mosquito populations have opened up new prospects for the control of certain diseases by techniques based on genetics and leading to the autodestruction of the vectors (see page 141).*

- *When the world-wide malaria eradication campaign began in 1955, it was believed that antimalarial drugs would have a relatively unimportant part to play. Now, however, opinion on their role has changed, and their value in all phases of eradication programmes has been recognized (see page 128).*

- *It has been estimated that, in North America, the number of dental extractions due to periodontal disease in men over 35 and women over 40 is 2-3 times as high as the number due to caries, while about half the adults who still retain some teeth at the age of 50 show evidence of gross and extensive destruction of the supporting tissues (see page 151).*

- *"Comprehensive nursing care" is a return to the personal type of care given by the old village nurse, but reinforced by modern ideas and techniques. The nurse providing this care needs to be a friend, supporter, counsellor, and health teacher to her patients, as well as a trained technician (see page 155).*

FOURTEENTH WORLD HEALTH ASSEMBLY - 1

The Fourteenth World Health Assembly was held from 7 to 24 February 1961 at Vigyan Bhavan, New Delhi, India. It was attended by delegations from 99 of WHO's Member States, as well as representatives of the United Nations, specialized agencies, and non-governmental international organizations in official relations with WHO. The delegates were welcomed, on behalf of the Government of India, by Mr D. P. Karmarkar, Minister of Health, who said that the holding of the Assembly in New Delhi was a significant event for his country, particularly as it was the first World Health Assembly to be held in Asia.

In his opening address, the outgoing President, Dr H. B. Turbott, Director-General of Health of New Zealand, welcomed the Honourable Mr Jawaharlal Nehru, Prime Minister of India, and other distinguished guests, as well as the participants in the Assembly, in particular the delegates of those States which had become full Members of the Organization during the preceding year. After reviewing the work of WHO during 1960, Dr Turbott went on to say:

" Our organization stands for equality for all in health. The counter to much of the world's disease lies in fighting malnutrition, intestinal diseases from faulty sanitation, and general ignorance . . . of healthful living. We have the knowledge and health educational skills to deal with these killers, but we must await that economic and social development that will make possible improved national feeding and sanitation. Meanwhile we WHO Members who ' have ' must encourage our countries in those international measures, financial, agricultural, and cultural, aimed at stimulating social progress and better standards of living in Members who ' have not '. Public health lags without money; economic development drags without health. It is our joy that our successes against specific diseases have helped to break this vicious circle, enabling disease-freed people to cultivate more land, produce more food, and have a higher standard of living. But, because public health, economic development, and social development march hand in hand, we must ever be willing to give understanding co-operation to sister agencies of the United Nations, WHO being entrusted with one facet, albeit an interlocking one, of the needs of our developing Members."

The Assembly was then addressed by the Honourable Mr Jawaharlal Nehru, Prime Minister of India; the text of his address will be found on page 126 of this number of *WHO Chronicle*.

By acclamation, Dr Arcot Lakshmanaswami Mudaliar, Vice-Chancellor of Madras University and Chief Delegate of India, was elected President of the Assembly. Dr A. Martínez Marchetti (Argentina), Dr J. Plojhar (Czechoslovakia), and Dr D. Samonte (Philippines) were elected Vice-Presidents.

In his presidential address, Dr Mudaliar said that, " among the many international organizations set up by the United Nations, the World Health Organization has come to occupy a foremost place in its efforts to improve the conditions of the millions of people in all parts of the globe ". He recalled the early days of the Organization and the part played by the Indian delegation to the First World Health Assembly in moving a resolution for the constitution of regional offices to facilitate the promotion of health in the different parts of the world. The subsequent establishment of the various WHO regional organizations had " contributed not a little to bringing the work of the Organization . . . more directly into contact with the countries concerned " with significant success.

" One of the great and spectacular changes that were made in the approach to problems of health was in the decision arrived at that henceforth the World Health Assembly should have as its policy and motto not the control of certain diseases but the eradication of these diseases, particularly diseases whose causative organisms are well known and in respect to which effective steps could be taken. It is owing to the genius of the present Director-General and his staff that the problem of malaria control was changed to one of malaria eradication . . . I need not go into the many steps that have been taken in the

promotion of this objective, but the significant decline in the incidence of malaria in many countries of the world shows not only how effectively this campaign has been carried on but it gives hope and cheer to the nations of the world that with regard to other diseases, also of a communicable nature, the word 'eradication' may well be writ large as a significant sign for the manner of tackling these diseases. I refer in particular to diseases like smallpox, cholera, several of the water-borne diseases and to many other diseases which are carried by insects."

Dr Mudaliar then referred to the work of WHO in various parts of the world stricken by natural or man-made disaster, and in particular to the Organization's emergency action in the Republic of the Congo (Leopoldville).

Of the tasks facing WHO in the future, Dr Mudaliar said:

"Great as has been the work of the World Health Organization during the last thirteen years, considerable as have been its achievements, significant as has been its effect on the reduction of morbidity and mortality in most lands, no one can deny that the World Health Organization has yet a greater part to play. It cannot afford to rest on its laurels. There are still many diseases which require its constant attention and intensified activity. Prominent among the four priorities established by the First World Health Assembly is tuberculosis and, although much has been done, much yet remains to be done in a constructive way to control this widespread scourge. It is of significance that, recently, experiments have been carried on in South India in the city of Madras, which tend to give us a ray of hope that by domiciliary treatment it may be possible to control the disease and to prevent its spread. I am glad indeed that the technical discussions this year will be on the subject of tuberculosis.

"Yet another disease which, in this region and in neighbouring regions, has caused a great deal of concern because of its method of insidious onset and the large numbers that are affected by it is leprosy. One need hardly say that from early times it has unfortunately been the practice to think of those suffering from this fell disease as persons who should be beyond the pale of society. Fortunately for them and fortunately for the conscience of humanity, the remedies that have been discovered have made it possible for such persons to be comparatively free of some of the obvious manifestations of the disease and, by suitable treatment or rehabilitation, to make them once more useful members of society. The work involved however is tremendous and it would be well for the World Health Organization to concentrate upon the eradication of leprosy also and to seek the co-operation of all governments and of the general public for the radical removal of this ancient scourge, which has from biblical times been dreaded by humanity.

"Yet, as disease after disease is being controlled, the problems of world health are becoming increasingly complex. New diseases have unfortunately come to light and some diseases have become much more common now than before. The stress and strain of modern civilization, the constant dreads which society has to bear from the action and reaction of world politics and the conditions prevalent in highly industrialized society, have unfortunately increased the cases of mental illness, fatigue and irritability and, what is more disquieting, this factor is as important in the young as in the old. As new discoveries are made and new remedies are placed in the hands of the medical profession, one has to realize that the goal of public health work in respect of most diseases which affect the masses of the people will be more of prevention than cure and that control and eradication are measures which must be thought of only when the diseases actually set in. And therefore it is that the World Health Organization has always insisted upon those factors which are conducive to the prevention of diseased conditions."

In conclusion, Dr Mudaliar said:

"No organization is so singularly devoted to the welfare of humanity as the World Health Organization. It has no other ideology, no other aims and no other objectives. And, so long as it is inspired by these high and noble ideals, I feel sure that it will command the sympathy and support of all countries in the world—a fact that is amply borne out by the very large number of countries that have become Members of this Organization. Let us continue this great task with humility but with the firm determination to render unto the people what is their due, to make life healthy and happy with a purpose, to be of greater and greater service to humanity at large."

Mr S. M. Keeny, Director of the Asia Regional Office of UNICEF, then read a message from Mr Dag Hammarskjöld, Secretary-General of the United Nations:

"I wish it were possible for me to be with you in person. The work of the World Health Organization is of special significance to the development of the United Nations system and of international co-operation in general. In particular it has helped to lay the foundations for progress in the direction of a multilateral approach to questions of economic and social

development, through its continuing efforts to meet and overcome problems in the field of health as instanced by its malaria and smallpox eradication programmes, and through its encouragement, as defined in its Constitution, of ' the attainment by all peoples of the highest possible level of health '.

" WHO can look back on a year of solid achievement, but it has before it problems of vast significance to the welfare of mankind. Close relations between WHO and other members of the United Nations family are of vital importance if the social and health aims outlined in Article 55 of the United Nations Charter and spelled out in resolutions of the Economic and Social Council and of the General Assembly are to be achieved. The attainment of higher health standards on a world-wide scale depends not only on health measures, but also on measures to raise standards of living and social conditions in general, in which the United Nations and other international agencies have an important role to play. In this common effort each can be successful only with the assistance of the others. I might illustrate this point by referring to a matter that is to be a subject for discussion at this Assembly, namely, assistance to the Republic of the Congo. The civilian operation of the United Nations family in the Congo has been a remarkable instance of co-operation on a large scale among international agencies involved. As stated by my special representative in the Congo in his first progress report to the Security Council last September: ' For the first time in the history of international organization the United Nations and the specialized agencies have collaborated in the Congo as a single team under the mandate of the Security Council, to meet the economic emergency following the country's independence. They have put together, in a little over a month, the largest civilian team they have ever had in one country at one time.'

" In the effort to meet a critical situation, new forms of international assistance are being developed. The operations have been based partly on the traditional pattern and methods of technical assistance and the provision of operational and executive personnel, but new ground has had to be broken. In addition to technical assistance proper, activities on a higher level of administrative responsibility under new and special arrangements have had to be undertaken by international officials in the Congo.

" The contribution of WHO to this operation cannot be over-estimated. Having been requested by the Security Council to render assistance, WHO has responded, under the terms of its Agreement with the United Nations, both promptly and in a spirit of helpful and practical co-operation. It has provided a senior consultant in health to the Consultative Group of the operation and has assigned a sizeable number of its staff members, who are responsible, with the Ministry of Health of the Republic, for co-ordinating all health work in the country. Its health teams and those provided by the Red Cross have carried out their tasks with devotion and a sense of self-sacrifice, under conditions of great difficulty. The long-term plans for the development of appropriate medical cadres and the training of medical personnel, elaborated by WHO, should become the basis for an improvement in the health of the population throughout the country.

" There are a number of other areas of mutual interest which deserve particular mention. Of special importance in my view is the assistance rendered by WHO in Africa, especially to newly independent countries, in response to resolutions of the General Assembly and the Economic and Social Council. The participation of WHO and other Members of the United Nations family in the long-term programmes in the field of community development, urbanization and housing provides significant examples of effective, concerted action at the international level. Mention should also be made of the fruitful contribution of WHO to projects of the Special Fund and the aid recently provided by WHO when disaster struck on a large scale in Chile and Morocco. Lastly, let me add that the co-operation of WHO in the work of the Asian population conference, scheduled for late 1962 or early 1963, under the auspices of the Economic Commission for Asia and the Far East, will be warmly welcomed.

" In concluding these remarks on some of our common endeavours, I have great pleasure in conveying to you my warm greetings and sincere good wishes for the success of your deliberations."

Presenting his report on the work of WHO during 1960,[1] Dr M. G. Candau, Director-General of WHO, commented first of all on the action taken by WHO in the Republic of the Congo (Leopoldville) immediately after that country gained its independence in July 1960. This was the first time that the Organization had had to combine emergency measures to satisfy immediate needs with long-term programmes to maintain and develop the basic health services. Dr Candau told the Assembly that WHO was now in the process of recruiting 130 health workers of all categories needed to fill key positions in the medical-surgical centres of the Republic. The task of assisting the country in the education and training of its own health personnel

[1] *Off. Rec. Wld Hlth Org.*, 1960, 105.

has also begun well: 61 *assistants médicaux* were studying in various universities of France to complete their full medical training, while 7 students from the Congo had commenced medical studies in France and in Switzerland. At the request of the Rector of the University of Lovanium, through the Government of the Republic, WHO was recruiting a number of professors in order to complete the teaching staff of the medical school and of the school of nursing. Dr Candau stressed the fact that WHO had been able to carry out its work in the Congo without any serious difficulty.

With regard to malaria eradication, Dr Candau expressed the hope that the Assembly would find a lasting solution to the financial difficulties that impede the execution of the programme and might soon jeopardize the results already achieved. Recently there had been indications of additional, and hitherto unexpected, benefits that might come from a successful all-out war on malaria. Anopheles mosquitos had for the first time been incriminated as vectors in a virus epidemic—the outbreak of o'nyong nuong fever, a disease carried by *Anopheles funestus* and *A. gambiae*, which started in East Africa in 1959 and had so far affected about 750 people. Thus the attack directed against the malaria vector should also significantly reduce the transmission of this other disease.

Another important feature of the activities described in the 1960 report was the continual stress laid on research. Despite certain financial difficulties, the intensified programme of medical research had been launched, with the highest priority given to the communicable diseases, particularly those prevalent in the tropics:

> " One of the facts which augur well for the future of work in this field is that scientists and field workers are increasingly adopting the ecological approach to the study of insect-borne diseases. Indeed, we know now that many costly failures could have been avoided in the past if the control of certain diseases had been based on sounder ecological principles. It is therefore most fortunate that the ecological concept of communicable disease is now being expanded beyond the phenomena of transmission to take into account the climate, geology and the whole structure and behaviour of animals and man and their interrelationship. Furthermore, a change in man's environment affecting his agricultural and industrial activities often results in a change in the very pattern of a disease. A comprehensive study of any communicable disease must consider all these factors in order to establish practical measures ensuring adequate control and eventually complete elimination of that disease."

Other features of the international research programme included efforts to improve the tools available for the investigation of the disease-carrying arthropods. The use of isotopes had been extended to studies of insect physiology and the mechanism of transmission, and it was hoped that it would help to solve the biochemical puzzle of the resistance of insects to insecticides.

Another part of the programme was co-operation with the chemical industry to find new compounds that could be successfully applied to problems of public health:

> " We now have a five-stage programme involving six laboratories in different parts of the world and a research team established in Lagos, Nigeria. This programme is destined to test as many as 300 compounds a year, and at present more than 120 are being examined. Already a number of promising new chemical groupings have emerged from this undertaking, and we are about to use them in carefully controlled field trials on the vectors of trypanosomiasis, typhus fever, onchocerciasis, filiariasis, Chagas' disease, and plague."

Dr Candau next referred to the new prospects for the control of trachoma opened up by the isolation of the virus, and to the progress in poliomyelitis research which had made it possible to envisage the eventual elimination of the disease. Nevertheless, the development of live vaccines still left many problems to be solved in laboratories and in the field.

More countries had achieved independence in 1960 than during any one year in the past—17 in Africa alone. As a result the membership of WHO had increased to 106 with 104 full Members and 2 Associate Members. Dr Candau went on to speak of " the opportunities which lie before the international community in assisting the newly developing countries in their economic and social

development ". It was, he said, the duty of the Assembly to emphasize the indissoluble relationship between health and economic and social development:

" We in WHO believe . . . that the tragic and all too familiar cycle of ill health leading to poverty and poverty causing ill health must be broken through the concurrent and concerted action of all branches of science and technology. Only then can we be sure that our Organization may make its modest but essential contribution to the great undertaking launched in our time to eliminate poverty, disease and ignorance from the face of the earth, so that the people of all races and of all nations can build the healthy, prosperous and peaceful international society which is still the cherished dream of all of us."

* * *

An account of the discussions on the Director-General's report and of the principal decisions of the Assembly will appear in the next number of *WHO Chronicle*.

Dr ARCOT MUDALIAR

President of the Fourteenth World Health Assembly

Dr Arcot Lakshmanaswami Mudaliar, M.D. (Madras), LL.D., D.Sc., D.C.L. (Oxon.), F.R.C.O.G., F.A.C.S., President of the Fourteenth World Health Assembly, was born in Kurnool, India, in 1887. In the course of a distinguished career, he has served as Professor of Gynaecology at Madras Medical College from 1934 to 1942, as Principal of Madras Medical College from 1939 to 1942, and as Vice-Chancellor of the University of Madras from 1942 until the present. He has been a member of the Indian Medical Council since its inception, and has been chairman of a number of committees concerned with both secondary and university education. He is also a member of the Legislative Council of Madras.

Dr Mudaliar has been associated with WHO since its foundation, and has attended every session of the World Health Assembly, either as delegate of his country or as representative of the WHO Executive Board. He was Chairman of the Executive Board of WHO at its fourth and fifth sessions (1949-50). He has also served on the Indian delegation to UNESCO.

THE CONTEXT OF HEALTH

Address by the Honourable Mr Jawaharlal Nehru, Prime Minister of India, to the Fourteenth World Health Assembly

We feel honoured by this World Health Assembly meeting here in this old city of Delhi. It is an honour, for [WHO], in the brief course of thirteen or maybe fourteen years, has done much good work and has such achievements to its credit and, what is more, has laid the foundations of so much good work in the future.

There are many world organizations today, a number of them stemming from the United Nations, as does WHO. Without meaning any disrespect to any of the others, I might say that the World Health Organization has probably steered clear of many of the controversies and conflicts that afflict some of the other organizations, and that come in the way of their successful achievement of the tasks before them.

The list of achievements of WHO is formidable. It is impressive. But I imagine that, apart from the practical achievements, if I may say so, the other achievement—not something that you can easily grasp, but nevertheless which is there and which is very evident—is the consideration of international problems in a peaceful way, not dividing yourselves into national or other groups and rather by-passing the main task because . . . other conflicts come into your work. That is a great achievement, because perhaps the most important thing in the world today is to achieve that objectivity in considering problems, that spirit of co-operation, which sometimes we sadly lack.

I suppose it may be said that most of the problems that afflict mankind today—not all, but most, and certainly the primary problems of health, education, the general welfare of the community, food, clothing, housing and such problems—are capable of solution by the means at hand in the world, not in each country at the present moment, but in the world as a whole. We have the means at hand to solve these problems and build up a measure of welfare throughout the world, a measure of health, a measure of education. We have that, and we have it in recent times for the first time in history. Going back a generation or a little more, that statement could not have been made. The world was not in a position to grapple with these problems and solve them. But today the world *is* in that position theoretically, and to some extent practically. But other things come in the way, other obstructions, with the result that the capacity for work which it undoubtedly possesses is not fully used and sometimes our efforts do not succeed and a sense of frustration comes over us. Now that perhaps applies less to the work of WHO than to other great organizations. And, therefore, WHO helps—as other organizations too, but perhaps more so WHO—in this vital task of promoting a spirit of co-operation, of making people realize, as I believe it is stated in your approach to these problems, that the world is becoming progressively one unit in regard to its major problems. It is difficult enough to solve any major problem of the world by taking bits of it apart and ignoring the rest, whether it is disease, whether it is anything. If that is difficult, it becomes even more difficult when the different bits pull against each other and come in the way of each other. You are of course engaged in this great Assembly in an important task of spreading physical health, but in an even more important task of creating an atmosphere conducive to the mental health of the general community. As every doctor I believe knows, physical health is very much dependent on mental health. You can hardly separate the two. The world today, which can deal with the problem of physical health satisfactorily enough, though it may take a little time, has still to find ways of dealing with the mental health of nations, groups and communities. I hope that this Assembly, this organization, though perhaps it cannot tackle their problems directly, will nevertheless indirectly make that approach and help those forces, those elements in the world today which are trying to reach this state of mental health of the world community.

The achievements of WHO are very considerable, partly I think because the intrusion of mental conflicts has not come there: it is a straightforward course of dealing with problems—some of them very difficult problems, but nevertheless there is no mental obstruction coming in the way as it does in other matters, political and economic. I think one of the reasons why this success has been considerable is this absence of mental obstruction which comes from pulling in different directions. We hope that that will lessen and then the progress that you or other great organizations make will be very considerable, much more so even than now.

In our country, in the last thirteen years since we became independent, we have been rather over-

whelmed by problems. Not that we are afraid of problems, and they did not come to us suddenly without notice: they were there. We inherited them and we had to deal with them. And remember that almost every problem that we have to deal with has to be multiplied by 400 million. So we get a large figure: that is, the population of this country. We think of these problems in terms of the 400 million, not in terms of some inchoate mass of humanity or some concept of the state apart from the individual, but in terms of the welfare of the 400-odd million people in this country. So the problems increase in size and become very big. We are directly dealing with them; we shall continue to deal with them, with a measure of success I think, and indeed the odd thing is that, as we succeed, other avenues open out and other and more difficult problems face us. That is a measure of success. It is only those people or those communities that are not moving and that are stagnant that have practically no problems before them.

Well, we are moving in India I believe, and moving fairly fast, and with a certain dynamism behind that movement, and so problems surround us. Health is one of them, education another basic problem, and behind it all economic betterment, which gives us the capacity and the means to deal with these other problems. We have to choose, and often enough it is a hard choice, whether we should devote more of our resources to education, to health, to agriculture, to industry and so many other things. The fact of the matter is that everything is interconnected and we can only see it properly in the context of other things: they cannot be separated. Therefore we go in for planning, trying to understand the whole picture in a connected way. Naturally it is not easy and we fail to understand it fully, because life is too complicated, life in a huge country like India struggling out of the past into the present certainly, but almost into the future at the same time—because in India we live simultaneously in all the centuries of the past and in the present, and with our foot in the future. It is a fascinating spectacle, a fascinating experience and an exciting one; and every success that we achieve naturally gives us greater strength to face the future.

Now it is odd that success itself sometimes, as I said, leads to greater problems. The President in his address mentioned the fall in infant mortality, which is very considerable. I remember many years ago, in the 'twenties as far as I remember . . . reading about the expectation of life in India. It was then said to be, I believe, 24 years, which is fantastically low, chiefly because of infant mortality. Round about 1947, when we achieved independence, it had gradually crept up to 32, which is low enough. In the last thirteen years it has come up to 42, which is a fairly substantial advance in this period; and it is going up and up, which in itself is a measure of the cumulative effect of the various health measures that have been taken by us, and in which I am happy to acknowledge the help of the World Health Organization.

So we are progressing along those lines and as we progress towards better health, our population rises more and more. Deaths are relatively fewer and the death-rate goes down. The ratio increase of the population goes up, presenting us with another basic problem. I mentioned how all our good efforts sometimes lead to new situations which become rather overwhelming. That is bound to happen, and therefore we have to see all these various problems in a connected way. We shall struggle on with faith and hope and with a certain confidence in our future and the world's future. But there is one thought which I should like to share with you. It is not a problem of the present in India, because in India or in the underdeveloped countries our problems are how to provide the basic necessities of life to our people, whether it is food, clothing, or housing, as I mentioned, or health and education. These are the basic necessities which every human being should possess. That is our problem, and the problem of every undeveloped country.

But in the case of industrially or economically advanced communities, in the case of nations which have largely developed affluent societies, problems are different. They have got the basic necessities of life, by and large, and so they have to face entirely different problems. That is why, in trying to understand the state of the world today, we sometimes get rather lost in political divisions, political arguments and the like, important as they are in their right place. But the most important thing is, in considering the world, this division of the advanced, the prosperous communities of the world and those that are underdeveloped and therefore poverty-stricken, where even the basic necessities of life are lacking for many people. That is the real division in the world, and that is a division which is not only bad in itself, but which brings dangers in its train—political dangers, economic dangers, social dangers, all kinds of things. I believe it is now being recognized more and more that this question of dealing with those countries is not merely one of doing a good thing, but something which is necessary from the points of view of the health, the political health, the social health, of the world community as a whole.

We are struggling, as I said, for the basic things of life in India, and in many countries of Asia, and in many countries of Africa, in various degrees—some may be a little more developed than others, but basically they are under-developed—we are struggling for that. In the other countries, the industrially and economically more advanced countries, there seem to be new dangers arising. I mention them as a layman merely, as I know not much about

them. New dangers, almost you might say sapping the health of the community; dangers of the mind and the spirit, a neurosis let us say. There is no lack of the normal good things of life, but somehow the flavour of life, the spice of life, the sense of adventure, the sense of facing problems, becomes less when everything happens as planned; and maybe a sense of frustration comes into the minds of people. I do not know, I just put it to you for consideration. There is more leisure and people do not know how to utilize that leisure. All this you know better than I do.

Anyhow that is not our problem, and that is not the problem of countries that are under-developed. I am very glad that there are a number of new Members of this Assembly from the independent States of Africa. As we all know, this last year ... stands out among other things perhaps more specially because of the developments in Africa. Africa is a vital, dynamic place. There may be trouble there and there may be conflict there, and there may and will be, I am sure, advance in many ways; but one thing is certain, that it is today, and is going to be, a vital, dynamic place, for good or bad as you like. It is good that it has come out of that morass in which it was stuck; it has come out perhaps in some places in a bad way; by a bad way, I mean that the manner of its coming out showed how badly prepared it had been in the past. Whatever that may be, the fact is that the countries of Africa are of vital importance in the world, to the health of the world, apart from their own problems. And I think that all countries that are favourably circumstanced, I mean India and other countries like her which are struggling with their own difficult problems should, so far as is possible for them, stretch out their hand of help to these countries of Africa which have newly come into this world community and face these difficult problems.

You drew attention, Mr President, in your remarks to the help given to the Republic of the Congo by WHO. Undoubtedly that is very considerable help, and it has come at a time when it was most needed. The success of this help compares rather favourably, if I may say so, with the political aspect and the political problems there and the conflicts that have taken place and still are unresolved. It shows how the work of the World Health Assembly, lacking as it does the political motive, is much healthier than the work of other organizations. And I hope it will always keep away from these political motives and political conflicts and deal with the problems in the spirit of a common humanity. Till that spirit prevails all over the world, in all our problems there will be difficulties and conflicts.

CHEMOTHERAPY OF MALARIA *

The chemotherapy of malaria has had a chequered history, much of which still remains to be written. The past twenty years have witnessed the spectacular decline of quinine, the equally spectacular success of a few synthetic antimalarials, and also a series of disappointments with a certain number of such compounds. An assessment of the situation five years ago was made by Covell, Coatney, Field and Singh in a WHO monograph [1] published in 1955, the year when the idea of global malaria eradication was approved by the Eighth World Health Assembly. During the past five years, opinion on the role to be played by antimalarial drugs in this great collaborative human endeavour has undergone a subtle change.

The general view at the outset was that residual insecticides alone would be sufficient to interrupt transmission of malaria and that drugs would be of relatively small importance except in radical treatment of relapsing infections. In its sixth report [2] the WHO Expert Committee on Malaria fully recognized the particular value of drugs in the terminal phases of malaria eradication programmes, but pointed out the difficulties of mass drug administration in the attack phase and mentioned the potential importance of such procedures only in tropical Africa.

In its seventh report [3] the Expert Committee on Malaria outlined in more detail the role of chemotherapy in malaria eradica-

* Extracts from an introductory talk by Dr L. J. Bruce-Chwatt, Chief, Research and Technical Intelligence, Division of Malaria Eradication, WHO, at a Technical Meeting on the Chemotherapy of Malaria, held in Geneva by WHO from 14 to 19 November 1960.

[1] Covell, G. et al. (1955) *Chemotherapy of malaria* (*World Health Organization : Monograph Series*, No. 27).

[2] *Wld Hlth Org. techn. Rep. Ser.*, 1957, **123**.

[3] *Wld Hlth Org. techn. Rep. Ser.*, 1959, **162**.

tion and stated that the time required for interruption of transmission and elimination of the parasite reservoir might be shortened by the use of antimalarial drugs.

In its eighth report [4] the Committee went further by stating: "It is now recognized that in some parts of the world the chemotherapy of malaria has its place also in the attack phase either in conjunction with residual insecticides if their action is too slow or without residual insecticides if these cannot be used effectively." The Committee added, however, a reminder that there is as yet no proof that eradication of malaria from any sizeable area can be accomplished by the exclusive use of existing drugs with present methods of administration.

Before asking: "Where do we go from here?" it is a good thing to ask: "Where are we now?" A broad outline of the present status of antimalarial drugs will answer the second of these questions.

The rationale of the present use of drugs in WHO malaria eradication programmes can be summarized as follows:

1. Schizontocidal drugs (chloroquine or amodiaquine) are used occasionally in the early stage of the attack phase, more generally in the late stage of the attack phase, and always in the consolidation phase for the "presumptive treatment" given to all suspected cases of malaria for relief of clinical symptoms. This administration of a single dose of the drug to all detected fever cases is one of the characteristics of the surveillance activity that starts towards the latter part of the attack phase of malaria eradication, covers the whole of the consolidation phase, and extends over at least part of the maintenance phase.

2. A sporontocidal drug (generally pyrimethamine) is often associated with the schizontocidal drug in the "presumptive treatment" of the attack and consolidation phases with the purpose of making the suspected case of malaria non-infective to *Anopheles* vectors.

3. Mass administration of schizontocidal drugs alone or in association with such sporontocidal drugs as pyrimethamine or primaquine has also been adopted during the attack phase together with residual spraying when the conditions are such that anti-anopheline measures are unlikely to have a rapid or complete effect. This use of drugs is still tentative; they have been given either as a single dose at long intervals at the time of residual spraying, or as a repeated (weekly or monthly) dose for some definite period.

The distribution of medicated salt is actually a variant of mass drug administration, applicable in conditions when residual spraying is not, for various reasons, feasible. Chloroquine or pyrimethamine have been used for admixture with salt, but the latter drug is no longer advocated for this purpose.

4. Radical treatment of relapsing malaria means generally the use of 8-aminoquinolines for vivax and malariae infections, since falciparum malaria is easily cured by a standard 3-day treatment with chloroquine or amodiaquine. The proper administration of daily primaquine or quinocide over a 14-day period is often difficult without a wide network of medical services, and in such cases large single doses or smaller repeated doses of a sporontocidal drug (pyrimethamine) have been tentatively given.

The following aspects of chemotherapy are among those of immediate interest for malaria eradication.

First of all, it should perhaps be admitted that there is a great difference between the approach of the clinician interested in treatment of a case of malaria and that of the malariologist whose aim is the eradication of this infection from a large community. From the point of view of the clinician no new antimalarials are really necessary; he has quinine or, preferably, one or other of the 4-aminoquinolines for treatment of severe infections; if he wants to prevent relapses one of the modern 8-aminoquinolines—quite safe when given with some elementary precautions and almost 100% reliable—is available; for protection from infection the clinician has the choice of proguanil, pyrimethamine, and (in the second place) chloroquine or amodiaquine: any of these drugs

[4] *Wld Hlth Org. techn. Rep. Ser.*, 1961, **205**.

will serve his purpose when given at proper and regular intervals.

For the malariologist, whose patient is not an individual but a sick community, all these drugs have one flaw: they must be given in regular, repeated doses to achieve their effect on the transmission of malaria. In this respect they are often a failure when used on a large scale in countries without extensive and well-organized medical and public health systems. None of the present drugs has a sufficient " carry-over " effect to be given either in a single large dose, as procaine penicillin with aluminium stearate can be given for the eradication of the endemic treponematoses, or at long, 6-month intervals, as pentamidine for trypanosomiasis.

In no other disease is the difference so marked as it is in malaria between the ease of treatment of the single clinical case and the difficulty of mass drug administration for the purpose of eradicating the disease.

In reassessing the problems of chemotherapy in malaria eradication, it may be helpful to ask two questions: " How can the best use be made of the antimalarials now available? ", and " What new drugs are needed, if any? "

Improvements in operational conditions, better co-operation from an enlightened community or the introduction of some relatively simple technical innovations may remove a number of obstacles to a wider use of drugs in malaria eradication, but are not always feasible in under-developed areas with inadequately organized public health services.

The acquired tolerance of some populations to malaria infection has an immediate bearing on the acceptance of drugs in tropical Africa. Regular periodical mass drug administration with complete coverage by the usual methods is most difficult in those countries where the disease is prevalent but produces relatively mild effects in adults and adolescents and results in a large proportion of symptomless parasite carriers. Only a very determined effort of public health education and other forms of effective persuasion will decrease collective " consumer resistance " and improve the chances of success in such conditions.

A good example of how a relatively minor technical improvement might greatly improve the possibilities of using one of the known drugs is the recent introduction of a premix of chloroquine and common salt in which the active drug is coated by cetyl-stearyl alcohol. This preparation decreases the solubility of chloroquine diphosphate and protects the active compound in medicated salt from the leaching effect of high humidity.

It is evident that methods of using the present drugs must take into account not only scientific principles of chemotherapy but also operational possibilities, which depend on each human community involved and on its physical environment. Thus a certain margin of variability in the drug regimen or drug dosage adopted in various countries is not only permissible but even necessary.

Nevertheless, international co-operation in the field of malariology would be easier if there could be better agreement on the dosage of drugs used in malaria eradication programmes. Without rigidly standardizing the schedules and dosages of these drugs, chemotherapeutic tactics might be streamlined to some advantage.

As for the second question: " What new drugs are needed? ", the answer is that at least two types of antimalarial must be developed:

1. A potent and safe schizontocidal drug that will maintain its effect for 3-6 months after a single dose. It would be better still if this drug had a rapid and prolonged sporontocidal action.

2. A good and safe antirelapse drug capable of effecting a radical cure of vivax and malariae infections when given in a single dose or at most in a 3-day course of treatment.

It has been stated repeatedly over the past five years that the development of new antimalarial drugs has not been as fast or as successful as expected. Perhaps over-optimistically, it has been assumed that the present success of malaria eradication, based mainly on the application of residual insecticides, will continue in the future, and this is one reason why work on antimalarial drugs has been less intensive than it might have been.

There are two other reasons for the apparent lack of purposive drive in research on new antimalarials: one is the empirical approach to the investigation of new compounds, the other is the growing difficulty of gauging their value in human malaria.

The way in which thousands of new chemical compounds are still tested today for their action on malaria parasites is reminiscent of Ehrlich's search for his " magic bullets ". One compound after another is picked up from the shelves and screened routinely for antiparasitic action. The reason for this is that little is known about the metabolism of the parasite within the host or about the metabolism of the infected cell. It is true that research which only partially fulfils the promise of giving an effective drug may still be incidentally helpful in increasing knowledge of specific aspects of cell metabolism essential for further research on chemotherapy. Thus the discovery of antimetabolites opened up new ways of studying cellular synthesis of protein and nucleic acid and the functions of the B group of vitamins. Often enough discussions on the action of a drug on the parasite or the host have been based on the consideration of their separate metabolism, yet chemotherapy is concerned with the metabolism of the parasite within the general environment of the infected host —a subject on which information is still meagre and fragmentary.

Some recent studies *in vitro* showed that the incorporation of P^{32} labelled phosphate by ribonucleic acid (RNA) and deoxyribonucleic acid (DNA) in *Plasmodium gallinaceum* was affected by the action of antimalarial drugs; rapid schizontocides such as quinine, mepacrine and chloroquine directly inhibit RNA and DNA incorporation of phosphate while the slow-acting pyrimethamine inhibits DNA incorporation only and proguanil is inactive because it forms the active metabolite in the body.

This type of research on the biochemistry of antimalarial drugs is badly needed; it is immaterial whether it is called fundamental or applied or even speculative, provided it fills the gaps in our knowledge of the action of the drug on the parasite.

A striking trend in the field of malaria chemotherapy is the renewed interest in drug combinations and associations. As a result of toxic effects reported twenty years ago from combinations of pamaquin and mepacrine there has been a preference for single drugs, especially as some of the modern synthetics were so successful. Hopes have now been expressed that the shortcomings of single drugs may be overcome by using drug associations. Workers in France and the USSR have employed drug combinations for many years, but it seems that their experience has not been given adequate attention or recognition.

Also in connexion with drug associations much empiricism prevails because so little is known about drug potentiation, either experimentally or in actual practice in the field. As a matter of fact no complete agreement has yet been reached about what is meant by an additive effect, by synergy, or by potentiation. A good example of drug potentiation is that of pyrimethamine with sulfadiazine in infections with *P. gallinaceum* and recently also in falciparum malaria. The two drugs act on parasites that synthesize folinic acid from para-amino-benzoic acid and on different stages of the single metabolic pathway, so that the resultant effect is greater than would be expected from the simple addition of their separate effects. This drug combination has been utilized in the treatment of human toxoplasmosis and of coccidiosis in chickens, but not yet on any large scale in human malaria. Much work has been carried out on the assessment of the sporontocidal effect of 8-aminoquinolines combined with pyrimethamine. The demonstration of the value of an association of 4-aminoquinolines and 8-aminoquinolines (administered once a week for 8 weeks) for the radical treatment of relapsing vivax malaria is of great interest, especially as such a regimen seems to prevent the side effects of 8-aminoquinolines in sensitive individuals.

One of the great obstacles that today confronts any attempt to assess the practical value of a new antimalarial is the growing difficulty of testing it on cases of human malaria. The screening of new compounds

on bird malaria is only the first step in experimental chemotherapy, and rodent malaria has proved, from this point of view, to be singularly disappointing.

It is likely that a new chapter in the experimental chemotherapy of malaria was opened by the finding of the mosquito transmissibility of *P. cynomolgi bastianellii* of lower monkeys to man, and this discovery bears much promise for the future. Nevertheless at the present time the ultimate value of a new antimalarial can only be assessed on man.

Until relatively recently there was the invaluable possibility of testing the new drugs on cases of induced malaria in neurosyphilitics, and the part played by such treatment centres as Horton in England, Talahassie in the USA, Amsterdam in the Netherlands, and Berceni and Socola in Romania was very great. With the gradual disappearance of neurosyphilis there remain only two ways of finally testing new antimalarial drugs on man: either by using volunteers or by carrying out field trials in those parts of the world where malaria is endemic. There are very few countries where drug trials on volunteers are possible and the proposal for setting up an international centre for this purpose under the aegis of WHO deserves much attention.

It is not easy for the scientist accustomed to designing clear-cut laboratory experiments to appreciate the difficulties of any field trial on human subjects. How seldom in practice can one find a sufficient number of suitable patients free from complicating factors, physical, emotional and ethical, that may obscure the results! How rarely can one solve the problem of securing and maintaining for long periods the interest and cooperation not only of the patients but also of the auxiliary staff!

Field trials of new drugs in endemic malarious areas started in West Africa ten years ago and have been taken up in other parts of the world.

While such trials are of definite value in the comparative assessment of the clearance time and side effects of drugs, they have a drawback, since they are carried out on semi-immune populations whose response to antimalarials is intrinsically affected by their higher tolerance of the parasite—the degree of such tolerance varies not only from one age group to another but also from one individual to another. The interpretation of these trials is difficult and must be made with caution. On the other hand, large-scale field trials in endemic areas, while difficult to set up, are at times more satisfactory than a few tests against induced infections on non-immune subjects. Induced infections are frequently more sensitive to drugs than naturally occurring malarias, and the multiplicity of strains causing the latter is an added advantage.

The problem of drug resistance is of fundamental significance, even though its importance in practice is fortunately still limited. The development of resistance to pyrimethamine in the field has now been reported from a number of areas in tropical Africa, from New Guinea, from Venezuela and perhaps from Tadjikistan and north Viet-Nam; analysis of these observations did not indicate any specific common causal denominator. The whole problem of drug resistance requires much more fundamental research, covering biochemistry and genetics. In the meantime pyrimethamine maintains its value as a true prophylactic and sporontocidal drug in areas where resistance to it is unknown. Experience has made it clear that the use of pyrimethamine as a curative or merely suppressive drug in highly endemic areas must be regarded as an error and discouraged whenever possible.

It is surprising that the resistance to proguanil encountered in Malaya has not been reported from other parts of the world; the relative rarity of such resistance is probably due in part to rapid excretion of this drug. Whether the recently reported resistance of a strain of *P. vivax* to primaquine is of practical importance in the field remains to be seen; the same applies to the possibility of increased chloroquine tolerance of some pyrimethamine-resistant strains of *P. falciparum* in Africa and of *P. vivax* and *P. falciparum* in Venezuela and Colombia.

It is greatly to the credit of research workers that antimalarial drugs produce such infrequent and relatively mild side effects. In

most instances these effects are imputable to human error; they are frequently of " iatrogenic " origin. The greatest risk from the standpoint of toxicity seemed to lie in the use of 8-aminoquinolines (primaquine, quinocide) for radical treatment of relapsing malaria. Wide experience with these drugs, especially in the USA and USSR, showed that this risk was probably exaggerated. Research in the USA on the haemolytic properties of primaquine has produced incidental results of extraordinary scientific interest. Intensive biochemical research on primaquine sensitivity in certain individuals revealed the existence of an inherited sex-linked defect of metabolism (" glucose-6-phosphate dehydrogenase deficiency "), which is the expression of a more fundamental, as yet little known, abnormality of the haemoglobin. Studies on the frequency, degree and genetic transmission of primaquine sensitivity in many parts of the world are now in progress. This is a good example of how the pursuit of an observation in the field can open up new vistas for basic research encompassing several scientific disciplines.

NOTIFIABLE DISEASES IN THE AMERICAS, 1949-1958

Data on cases of notifiable diseases reported in the Americas from 1949 to 1958 have recently been published by the Pan American Sanitary Bureau (PASB), which acts as the WHO Regional Office for the Americas.[1] While every effort has been made to have these data checked by the health authorities in each country, the extent to which they provide an accurate picture of notifiable diseases varies widely from country to country, partly because the completeness of reporting is directly influenced by the availability of medical facilities and of full-time health services. Programmes for the prevention, control or eradication of specific diseases lead to an increase in the number of cases reported, because cases are specifically sought out. Thus, the interpretation of the data requires an understanding of national and local programmes. Efforts are being made in many areas to improve reporting, the PASB pamphlet *Basic Procedures for the Reporting of Communicable Diseases* [2] proving helpful.

Although in most countries of the Americas the reporting system covered the entire country, in 6—Brazil, Colombia, El Salvador, Paraguay, Peru, and Venezuela—it was limited to localities with health services. For Canada the data on some diseases do not represent national totals but rather cases in varying numbers of provinces for different years, since each province determines its own list of notifiable diseases. No data are included for the Northwest Territories, nor for the Yukon Territory prior to 1955.

Quarantinable diseases

Of the 6 quarantinable diseases, only cholera is absent from the Americas. Table 1 shows the reported cases of quarantinable diseases in the Americas in 1958 and 1959.

Plague

In 1958 all but one of the reported cases of plague occurred in Brazil, Ecuador and Peru; the remaining case was reported from Misiones Province, Argentina. In 1959, cases of plague continued to be reported from Brazil, Ecuador and Peru. Those reported in Brazil were in the State of Bahia only. The cases in Peru were in northern departments; those in Ecuador were in a southern province just north of the areas where cases were reported in Peru, as well as in the Province of Chimborazo.

[1] Pan American Sanitary Bureau (1960) *Reported cases of notifiable diseases in the Americas, 1949-1958* (Scientific Publications, No. 48), Washington, D.C.

[2] Pan American Sanitary Bureau (1954) *Basic procedures for the reporting of communicable diseases* (Scientific Publications, No. 9), Washington, D.C.

TABLE 1. REPORTED CASES OF QUARANTINABLE DISEASES IN THE AMERICAS, 1958 AND 1959

Area	1958					1959				
	Plague	Louse-borne relapsing fever	Smallpox	Yellow fever	Louse-borne typhus	Plague	Louse-borne relapsing fever	Smallpox	Yellow fever	Louse-borne typhus
Total	97	6	4339	61	818	92	2	3447	30	686
Argentina	1	—	27	—	—	—	—	34	—	4
Bolivia	—	—	183	2	15	—	1	7	2	29
Brazil	25	—	1232 [a]	26	—	16	—	1354 [a,b]	3	—
Chile	—	—	—	—	5	—	—	1	—	6
Colombia	—	—	2009	21	31	—	—	867	21	13
Ecuador	22	—	863	—	233	40	—	1184	—	290
Guatemala	—	—	—	—	8 [c]	—	—	—	—	—
Mexico	—	6	—	—	432	—	—	—	—	247
Panama	—	—	4 [d]	—	—	—	—	—	—	—
Paraguay	—	—	21	—	—	—	—	—	—	—
Peru	49	—	—	6	94	32	1	—	1	97
USA	—	—	—	—	—	4	—	—	—	—
Venezuela	—	—	—	6	—	—	—	—	1	—
Trinidad and Tobago	—	—	—	—	—	—	—	—	2	—

[a] Federal District and State capitals except Niteroi.
[b] Data incomplete for year.
[c] Including murine and unspecified typhus.
[d] Excluding 4 imported cases.

In 1959 3 cases of sylvatic plague were reported in rural areas of the USA: 1 in New Mexico and 2 in California. One laboratory-acquired case of plague occurred in Maryland.

In 1956 and 1957, cases of plague were reported in additional areas in 3 of the 5 countries mentioned above. In 1956 and earlier years, cases were also reported in Bolivia and Venezuela.

Louse-borne relapsing fever

This disease is of rare occurrence in the Americas, and only a few cases are reported each year. However, an outbreak of louse-borne relapsing fever occurred in Bolivia in 1949, and there were a large number of cases of relapsing fever, type unspecified, in 1953.

Smallpox

In 1949, the number of reported cases of smallpox in the Americas exceeded 18 000; in 1959, there were 3447. Three countries —Brazil, Colombia and Ecuador—accounted for 99% of the cases reported in 1959. In Brazil, data—available only for the Federal District and State capitals—are incomplete for that year, but in one of these capitals, Belo Horizonte, an epidemic occurred with an estimated 600 cases. In Colombia, there was a marked decline from 2009 reported cases in 1958 to 867 in 1959. The number of reported cases in Ecuador in 1959 was larger than in the previous three years, owing to small epidemics. In Argentina, 34 cases of smallpox were reported in 1959, in 9 provinces.

In Bolivia, where 2 400 000 persons were

vaccinated in 1958 under the eradication programme, there has subsequently been a marked decline. The 7 cases reported in 1959 all occurred in the Department of Potosi.

Contact with imported cases accounted for 1 case in Chile in 1959 and 4 cases in Panama in 1958.

Successful smallpox eradication programmes have been carried out in Mexico, Peru and Venezuela, and no cases have occurred in these countries in recent years. An active national campaign started in Colombia in 1955. The eradication of smallpox from the Americas is essentially a question of completing programmes in Brazil, Colombia and Ecuador, and eliminating the remaining foci of infection from Argentina and Bolivia.

Yellow fever

In 1959, 30 cases of jungle yellow fever were reported in 9 areas in Bolivia, Brazil, Colombia, Peru, Venezuela and Trinidad. Five single cases were reported in 5 areas, 2 cases each in 3 areas, and 19 cases in 1 area of the Intendency of Caqueta, Colombia. All cases were fatal, the diagnosis being confirmed by histopathological examination of liver specimens, except for those in Trinidad and 1 case in Caqueta, which were confirmed by isolation of the virus.

Louse-borne typhus

Cases of louse-borne typhus were reported in Mexico and in South America, especially in the Andean regions of the west coast.

Malaria

The numbers of reported cases of malaria in the countries of the Americas from 1949 to 1958 are given in Table 2. For 1958, the total number of reported cases was 207 527.

Almost all governments in the Region have initiated malaria eradication programmes. As eradication of the disease from the Americas progresses it is becoming increasingly important to have reliable data on its incidence, in order to evaluate the success of the projects. The report gives case rates per 100 000 population for major political divisions in 1958. In that year, 7092 cases of malaria were reported in Mexico, or 21.9 per 100 000 population. The areas with relatively high rates were located mainly along the coasts; three states near the southern border had each more than 100 cases per 100 000.

High rates were noted in the countries of Central America, with the highest in Honduras (921) and El Salvador (741); the rates by political divisions varied widely (from 1.5 to over 4000). Data were not available for the political divisions of Guatemala and Nicaragua, but national rates were 373 and 59 respectively.

Of the 9 provinces in Panama, 5 had case rates of over 500 per 100 000 population with the highest in the province adjoining Colombia. The highest rates in the Caribbean area were 757.7 for Haiti, 182 for Jamaica and 109.2 for Dominica.

Of the countries in South America, Colombia reported by far the largest number of cases—79 554, or a rate of 650.8 per 100 000 population. Fourteen out of 24 major political divisions had rates over 500 per 100 000 population, and in 8 of these the rate exceeded 1000. The rates for departments of Peru ranged from 3 to 2314, with an over-all national rate of 173 per 100 000 population. The only other country in South America with a rate over 100 was Ecuador (122.2).

In Venezuela, where the malaria eradication programme was started in 1950, the rate for the country was 12.9 per 100 000 population for 1958. The Federal Territory of Amazonas was the only major political division with a case rate exceeding 100.

Beginning in 1956, only laboratory-confirmed cases were reported in Brazil. The Territories of Amapa and Rondonia had rates exceeding 1000. Five other political divisions had rates over 100.

Total rates for Bolivia and Paraguay, respectively, were 53 and 23 per 100 000 population in 1958. Malaria occurred in 7 northern provinces of Argentina with a total estimated population of 3 295 000, the case rates ranging from 0.5 to 96.7. The disease was last reported in Chile in 1952 and has not occurred in Uruguay for many years.

TABLE 2. REPORTED CASES OF MALARIA IN THE AMERICAS, 1949-1958

Area	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Argentina	4 304	1 954	1 836	1 058	648	618	388	707	791	1 096
Bolivia	...	9 783	15 324	12 015	21 014	...	1 810	1 395	740	1 774
Brazil	110 992	104 777	195 786	165 933	209 755	243 246	383 946	17 973 [a]	18 488 [a]	22 906 [a]
Canada [b]	5	—	—	17	4	8	3	2	1	2
Chile	4	—	—	1	—	—	—	—	—	—
Colombia [c]	100 199	91 551	86 137	73 993	83 877	73 906	77 219	69 714	76 596	79 554
Costa Rica	...	10 595	9 256	2 223	1 407	1 368	1 090	1 379	1 699	2 544
Cuba	978	723	930	220	214	248	234	131	270	63
Dominican Republic [d]	52 578	43 528	27 934	29 364	6 206	9 092	10 392	1 831	1 533	2 676
Ecuador	6 221	...	...	...	...	787 [a]	1 341 [a]	661 [a]	1 655	4 945
El Salvador [c]	16 206	17 647	13 588	10 517	6 561	4 737	2 071	4 575	6 661	9 351
Guatemala	33 440	39 809	41 821	39 393	30 230	29 607	23 977	19 768	11 066	13 224
Haiti	49 876	50 364	46 070	90 928	48 300	77 535	19 614	9 534	15 219	25 943
Honduras	...	...	...	...	...	...	...	...	...	16 850
Mexico	73 639	73 029	54 366	55 991	50 947	48 521	41 169	33 360	20 333	7 092
Nicaragua	...	6 758	5 914	9 440	10 036	1 485	398 [a]	184 [a]	746	816
Panama	4 452	3 985	4 766	2 780	4 194	2 849	2 095	3 393	7 130	5 216
Paraguay [c]	2 220	7 224	13 918	9 113	6 971	4 216	717	443	461	260
Peru [c]	30 492	20 057	17 824	17 738	19 232	14 228	11 607	8 241	8 874	8 409
USA	4 151	2 184	5 600	7 023	1 310	715	522	234	132	85
Uruguay	—	—	—	—	—	—	—	—	—	—
Venezuela	2 032	2 111	2 421	2 699	2 261	1 487	1 158	1 228	782	816
Alaska	—	1	—	1	1	—	—	—	—	—
Bahama Islands	—	—	—	—	...	—	—	—	—	—
Barbados	*	*	*	*	*	*	*	*	*	*
Bermuda	...	...	...	...	...	...	...	...	...	...
British Guiana	4 674	1 840	1 008	181	83	31	82	42	4	114
British Honduras	3 200	4 225	2 500	2 484	1 884	1 100	1 233	302	234	288
Canal Zone	84	21	63	71	78	85	31	4	70	103
Falkland Islands	—	—	—	—	—	—	—	—	—	—
French Guiana	...	...	...	7	11	57	59	29	23	6
Guadeloupe	433	12	3	—	—	1	12	—	—	3
Hawaii [e]	163	1	58	97	106	—	—	6	6	1
Jamaica	...	...	...	...	...	4 417	3 381	3 712	4 239	2 966
Leeward Islands:										
Antigua	38	...	...	3	1 [f]	—	1 [f]	—	—	2 [f]
Montserrat	*	*	*	*	*	*	*	*	*	*
St Kitts-Nevis-Anguilla	...	43	6	2	2	—	1	—	—	—
Virgin Islands	...	—	1	—	—	—	—	—	...	...
Martinique	—	—	3	—	—	—	1	1	—	—
Netherlands Antilles	*	*	*	*	*	*	*	*	*	*
Puerto Rico	353	73	88	134	28	13	7	—	1	—
St Pierre and Miquelon	...	...	...	...	...	...	—	—	—	—
Surinam	2 296	1 843	1 013	979	769	535	498	447	288	146
Trinidad and Tobago	4 827	5 098	5 641	5 931	5 050	5 515	1 540	156	270	138
Virgin Islands (USA)	—	—	1	—	—	1	1	—	—	—
Windward Islands:										
Dominica	2 059	1 825	1 238	868	546	280	234	15	55	71
Grenada	...	...	3 233	3 784	3 598	2 747	...	...	...	...
St Lucia	8 707	6 141	6 574	6 234	3 225	3 042	2 495	2 279	295	67
St Vincent	1	9	34	116	5	—	—	—	...	...

... Data not available.
* Disease not notifiable.
— No cases.
[a] Positive slides.
[b] Excluding Northwest Territories. Including Newfoundland beginning July 1949. Including Yukon beginning January 1955.
[c] Reporting area.
[d] Data for 1949-1952 refer to years ended on June 30 of each year; data for 1953 refer to cases treated in hospitals.
[e] Including imported cases.
[f] Imported cases.

The figures given above are, of course, influenced by the reporting practices in the various countries. The completeness of reporting, and the criteria used to define cases vary from country to country. Mortality figures are also subject to variation owing to differences in the extent of medical certification and in registration practices. The table below—which covers only countries for which data on both cases and deaths were available—shows, for 1956, the numbers and rates per 100 000 population of cases and deaths from malaria in Northern, Middle, and South America: [3]

	Number		*Rate*		*Cases per death*
	Cases	*Deaths*	*Cases*	*Deaths*	
Northern America	242	14	0.1	0.0	17
Middle America	68 665	28 883	149.5	61.3	2
South America	99 443	2 894	87.6	4.3	20

In Northern America the death rate was less than 0.05 per 100 000 population.

All countries in Middle America had malaria death rates of at least 10 per 100 000 population, and in Guatemala the rate reached 219. In only 2 countries of South America—Colombia and Ecuador—was the rate more than 10 per 100 000.

The eradication programme started in Mexico in January 1957 is a good example of progress in the reduction of the disease. Fig. 1 shows the distribution of reported cases per 100 000 population by states for each of the years 1956, 1957 and 1958. The number of reported cases in Mexico decreased from 33 360 in 1956 (109.2 per 100 000 population) to 7092 in 1958, a rate of 21.9 per

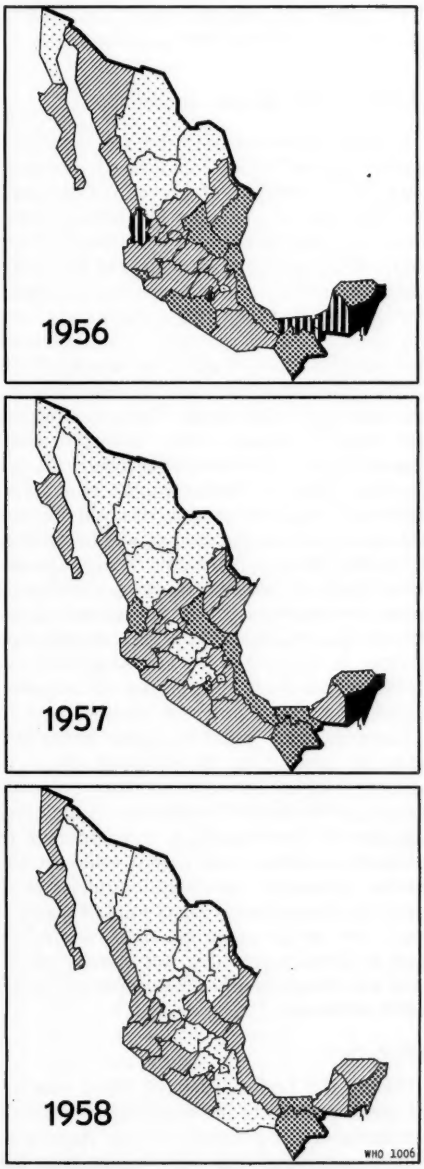
[3] This division of the Americas is in accordance with that employed by the United Nations, except that Greenland, which belongs to the European Region of WHO, is excluded.

Northern America: Canada, USA, Bermuda, and St Pierre and Miquelon.

Middle America: Mexico, Central America, Panama and the Caribbean republics and islands.

South America: All countries and territories of South America and the Falkland Islands.

FIG. 1. REPORTED CASES OF MALARIA PER 100 000 POPULATION BY STATES, MEXICO, 1956-1958



100 000. Only 5 states reported less than 10 cases per 100 000 population in 1956 but by 1958 almost half of the 32 states had lower rates than this. During 1959, only 1289 cases of malaria were reported in Mexico, or 4 per 100 000 population.

Communicable diseases in childhood

Certain communicable diseases are commonly referred to as "childhood diseases", since in the absence of preventive measures most persons are infected by them in childhood and are subsequently immune. They continue to be important causes of morbidity and mortality in many American countries. For some of them, e.g., diphtheria and whooping cough, effective immunization is available. Nevertheless, in many of the Latin American countries, preventive measures are not widely used. There is evidence that at the present time many of these diseases have more severe effects in Latin America than in Northern America. This difference may partly be due, in certain diseases, to the earlier age at which children in Latin America contract them. On the other hand, malnutrition among children in Latin America may add to the severity of the illness. Knowledge of the age distribution of cases is important for assessing both the problems involved and means of improvement.

These diseases usually appear every few years as epidemics, in different areas in different years. Because of their epidemic nature and because of variations in the completeness of the reporting, it is difficult to compare incidence and case fatality in the various countries. Even in countries with good reporting systems many mild or atypical cases are never reported, and secondary cases in families are often not seen by physicians and consequently never reported to the health authorities.

Diphtheria

During the period 1949-58, there was no consistent pattern in the reporting of cases of diphtheria in the countries of the Americas. In many countries, the rates remained at the same level from year to year; in some there was a decrease, particularly in the early years of the period. In a few countries increases were reported. The annual average diphtheria rates reported in the countries of the Americas in the three years 1956-1958 ranged from 0.7 to 29.7 per 100 000 population. For Northern America, the rate was 0.7 per 100 000, for Middle America 3.3, and for South America 13.5.

The table below shows the number of reported cases and deaths from diphtheria with rates per 100 000 population in the Americas in 1956:

	Number		*Rate*		*Cases per death*
	Cases	*Deaths*	*Cases*	*Deaths*	
Northern America	1 703	111	0.9	0.1	15
Middle America	1 611	631	4.0	1.5	3
South America	5 231	696	12.5	1.6	8

The data refer to 2 countries in Northern, 7 in Middle, and 4 in South America.

Whooping cough

In 1958, the reported cases of whooping cough per 100 000 population ranged, in the countries of the Americas, from 281 to less than 1. In Middle America the case rates were five times as much as in Northern America, and in South America they were seven times as much. In those Latin American countries for which data on age distribution of cases are available, about a quarter of reported cases were under 1 year of age, and about 70% under 5 years of age. In Canada, on the other hand, only 11% of cases were under 1 year of age and less than 50% were under 5 years of age.

Reported case rates are highest among infants, remain almost as high in the 1-4 year age group, and decrease with age thereafter. Whooping cough results in death more frequently among infants than among older children. Figures on the age distribution of deaths from whooping cough in 8 American countries in 1956 show that almost half the deaths were among infants and 93% among children less than 5 years of age. In Canada and the USA about 70% of deaths from whooping cough were among infants.

Poliomyelitis

Reported cases of poliomyelitis in Latin America increased during the ten years 1949-1958. In contrast, large numbers of cases were reported in the USA up to and including 1955. This was followed by a sharp decrease in the next three years when vaccination programmes using Salk-type vaccines were carried on; in 1959, however, there was again an increase in the number of cases reported. The increase reported in recent years in the Latin American countries may be partly attributed to improvements in diagnosis and in reporting procedures. However, recent epidemics in several countries suggest a true increase in the incidence of the disease. The annual average number of reported cases of poliomyelitis per 100 000 population in the period 1956-1958 was 4.9 in Northern, 3.2 in Middle, and 7.5 in South America. In Northern America reported cases include both paralytic and non-paralytic disease; in general, reported cases in the other countries of the Americas are paralytic.

In the Latin American countries, a high proportion of cases—usually from 70% to 90%—are under 5 years of age; the corresponding proportions in the USA and Canada are 33% and 27% respectively. Reported case rates by age for the 3-year period 1956-1958 are shown in Fig. 2 for Argentina, Canada, Chile, and the USA. In all 4 countries, the reported case rate is highest under 5 years—under 1 year in Argentina and Chile and between 1 and 4 years in the USA and Canada. Among persons 20 years of age and over the highest rates are found in the USA and Canada; these are almost ten times the corresponding rate in Chile and over twice that in Argentina. It would appear that early childhood infection with poliomyelitis without clinically identifiable disease (as well as with

FIG. 2. AVERAGE ANNUAL REPORTED CASES OF POLIOMYELITIS PER 100 000 POPULATION IN SELECTED COUNTRIES BY AGE, 1956-1958

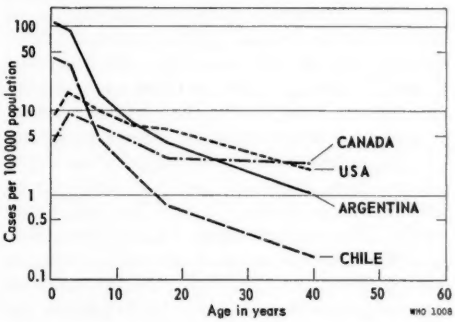


TABLE 3. CASES AND DEATHS FROM POLIOMYELITIS AND DEATHS PER 100 CASES IN SELECTED COUNTRIES, BY AGE, 1956

Age group	Argentina			Chile			USA			Venezuela [b]		
	Cases	Deaths	Deaths per 100 cases	Cases	Deaths	Deaths per 100 cases	Cases [a]	Deaths	Deaths per 100 cases	Cases	Deaths	Deaths per 100 cases
Total	6 496	595	9.2	719	87	12.1	15 140	566	3.7	171	20	11.7
Under 1	1 109	132	11.9	180	21	11.7	612	29	4.7	45	3	6.7
1-4	3 737	286	7.7	439	53	12.1	4 176	98	2.3	97	12	12.4
5-9	820	66	8.0	62	4	6.5	3 177	65	2.0	14	2	14.3
10-14	339	29	8.6	22	5	22.7	1 977	45	2.3	7	1	14.3
15-19	170	82	16.7	9	4	25.0	1 317	42	3.2	5	2	25.0
20 and over	321			7			3 881	287	7.4	3		

Cases of unknown age are distributed among age groups.

[a] Total reported cases distributed according to age distribution of 13 654 cases for which age was reported.

[b] Organized reporting area.

clinical disease) may be more general in Latin American countries and may serve to diminish the risk of disease at older ages.

Despite the irregular pattern of case fatality by age as measured by the ratio of deaths to reported cases, poliomyelitis is a more fatal disease for adults than for children (see Table 3). In the USA in 1956 case fatality (3.7%) was much lower than in other countries, which may in part be due to reporting of non-paralytic cases. It ranged from 7.4% among cases in the age group 20 and over to 2% in the age group 5-9. In Chile and Venezuela, the over-all case fatality rate was roughly three times as high (12%), with a very high death rate among the few cases in persons aged 10 and over. In Argentina the risk of death was also highest in older children and in adults.

The table below—containing data from 2 countries in Northern, 7 in Middle, and 4 in South America—shows reported cases and deaths from poliomyelitis with rates per 100 000 population in the Americas in 1956:

	Number		*Rate*		*Cases per death*
	Cases	*Deaths*	*Cases*	*Deaths*	
Northern America	15 747	617	8.5	0.3	25
Middle America	1 174	267	2.8	0.6	5
South America	7 663	782	18.3	1.8	10

Measles

The reporting of measles is far from complete in most areas, since medical care is not always necessary and often only the most severe cases or the first occurring in a family are reported to the health authorities. In 1956-58, 356 cases per 100 000 population were reported annually in Northern America, 94 in Middle America, and 200 in South America. Of the countries in the Americas the USA had the highest reported case rate of measles in that period.

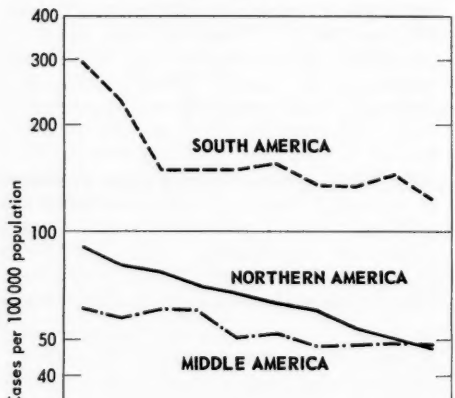
In general, almost 95% of children have measles by 15 years of age. The same age distribution of measles is found among cases reported in countries giving details on this point, though it must be remembered that these represent only a small proportion of all cases. In Middle and South American countries the age at which children contract measles is lower on the average than in Northern America. In 1956-58, for example, in 4 South American and 2 Middle American countries, over 13% of reported cases were under 1 year of age, over 70% under 5 years, and about 95% under 15 years. In Canada, on the other hand, only 3% of reported cases were under 1 year of age, only 31% were under 5 years, and 66% occurred in children over 5 years and under 15 years.

Despite variations in completeness of reporting by country and by age, there is evidence that the effects of measles are more severe and that it results in a higher death rate in the Latin American countries.

Tuberculosis

The number of reported cases of tuberculosis depends on the availability of diagnostic facilities and the extent to which case-finding covers the population. For example,

FIG. 3. REPORTED CASES OF TUBERCULOSIS PER 100 000 POPULATION IN THE AMERICAS, 1949-1958



the extension of mass X-raying in the USA resulted in an increase in reported cases until 1948. However, the decline of reported cases in recent years is largely due to the reduction of sources of infection. Tuberculosis case rates per 100 000 population in the period 1949-58 in Northern, Middle and South America are shown in Fig. 3. The consistent decline in the rates for Northern America is evident. For both Middle and South America some reduction has occurred, but this may be obscured by changes in case-finding programmes and reporting practices, and by the lack of data for some countries.

Typhoid fever

In 1958, 47 009 cases of typhoid fever were reported in the Americas. Although typhoid fever is a preventable disease, the number of cases reported annually increased in the 10-year period 1949-58. The case rate per 100 000 population was practically the same in 1958 as in 1949. Rates for Northern America were lower than for Middle and South America, and showed a downward trend throughout the period. Relatively less decrease occurred in the rate for Middle America, and there was an increase for South America between 1950 and 1958.

Zoonoses

The report also contains data on reported cases of selected zoonoses in man and animals in the Americas for the years 1956, 1957 and 1958. These data have already been reviewed in *WHO Chronicle*.[4]

[4] *WHO Chronicle*, 1960, **14**, 321.

GENETIC STUDIES OF AËDES AEGYPTI

Until quite recently practically nothing was known about the composition of populations of the vector mosquitos Culex, Anopheles *and* Aëdes. *Now, however, research on these three groups is proceeding at a number of laboratories. In an article on the genetic variability of* Aëdes aegypti *shortly to be published in the WHO Bulletin,*[1] *Craig et al. summarize previous work and discuss their own investigations, showing that this species, which was regarded as homogeneous, reveals, in fact, extreme biological plasticity. They then indicate the prospects opened up by genetics for the control of the vectors of yellow fever, of other virus diseases, and of filariasis, by methods leading to the autodestruction of the vector mosquitos.*

For a long time it was accepted, in the absence of proof to the contrary, that strains of mosquitos maintained in laboratory colonies were almost homogeneous and that their responses to outside influences would be uniform.

However, the entomologist is faced in the field with problems arising from genetic changes in populations of harmful insects. These changes are a consequence either of natural selection or of the selective pressure exerted by control measures. Insecticide resistance is a typical example of the latter. Behavioural changes and changes in the relationship between the insect and the parasite it harbours are also dependent on genetic selection. Consequently, it is important to know the potential variability within a species and its limits, as well as the range of responses that may be expected.

The lack of genetic information regarding *Aëdes aegypti* is particularly surprising, for this is an important vector which has long been known and is easy to breed in the laboratory. The idea that the species was rather uniform gained ground as a result of certain

[1] Craig, G. B., VandeHey, R. C. & Hickey, W. A. (1961) *Bull. Wld Hlth Org.*, **24** (In press).

observations made between 1928 and 1935. Nevertheless, in recent years more accurate data have been accumulated and, by 1957-58, Mattingly [2] could point out that *A. aegypti* was one of the most variable of all mosquitos with respect to colour pattern. He distinguished three forms: the type form, or *A. aegypti*, widely distributed throughout the range of the species; the dark, feral form from Africa south of the Sahara, sub-species *formosus*; the pale-scaled, highly domesticated form often found mixed with the type form, variety *queenslandensis*. These colour characteristics are accompanied by physiological and behavioural differences as regards degree of domesticity, host preference, choice of breeding places, biting cycles and possibly the ability to harbour and transmit such diseases as yellow fever and filariasis. According to McClelland,[3] there are differences in the activity and biting cycles between populations from Uganda (sub-species *formosus*) and populations from the Kenya coast (type form and variety *queenslandensis*).

The genetic phenomena governing the morphological differences and certain physiological characteristics are gradually being uncovered. Of these characteristics, insecticide resistance is of course of special interest to research workers. It has been shown that, in certain strains, DDT resistance is a single autosomal factor with incomplete dominance.[4] The same applies to dieldrin resistance, which is known to be linked with the gene for yellow larvae.

Observations made so far refute the idea that *A. aegypti* is a uniform species, revealing it rather as one with considerable biological plasticity. In the study to be published in the Bulletin, Craig et al. describe genetic analyses of morphological variation, the methods employed including both gross examination of populations and gamete analysis through inbreeding of single pairs. Among the characters whose genetic mechanism has been demonstrated, one in particular, to which we shall return later, may open up the way to new methods of control.

Strain analysis of *A. aegypti* has indicated that characteristic deviations occur with respect to sex ratio and this has been confirmed by the breeding of several successive generations. There are strains with a normal sex ratio (about 50% female), while others are subnormal (40% female) and still others have an abnormal sex ratio (below 30% female). Though little is known as yet of the sex-determining mechanism in *A. aegypti*, the authors whose work is summarized here have been able to show that a male-producing genetic factor exists in certain strains. Males from such strains, regardless of the type of female with which they are crossed, give progeny with a high proportion of males. A typical out-cross of one of these males with a normal female produced, in two egg clutches, 162 males and 6 females. It seems that this male-producing factor is transmitted only through the male.

However, the potential variability of a population does not manifest itself in its entirety; the great majority of recessive mutations existing in a heterozygous population remain hidden and, in order to bring them to light, experimental crossing and then recrossing of single pairs must be carried out using several hundred individuals, up to at least the fourth generation. In the study in question, some 2000 individuals, derived from 37 couples, were analysed. Only 10 of these 37 couples did not produce any mutants in their progeny. The remaining 27 gave rise to 63 mutants. In comparison with *Drosophila* populations studied genetically in the same way, *A. aegypti* showed a higher number of mutants, a higher number of kinds of mutants, and a higher average number of mutants per pair.

It would be going too far to apply to wild populations the results of a study limited to laboratory strains, all the more so in that these particular investigations dealt only with the type form and variety *queenslandensis*. It still remains to be shown, in fact, that variations appearing in the laboratory also appear in nature, and the search for mutations calls for

[2] Mattingly, P. F. (1957) *Ann. trop. Med. Parasit.*, **51**, 392; (1958) *Ann. trop. Med. Parasit.*, **52**, 5.

[3] McClelland, G. A. H. (1959) *Bull. ent. Res.*, **50**, 687.

[4] Coker, W. Z. (1957) *Inheritance of DDT resistance in* Aëdes aegypti, London (M. S. Thesis, London School of Hygiene and Tropical Medicine); Qutubuddin, M. (1958) *Bull. Wld. Hlth Org.*, **19**, 1109.

a skill and acuity of observation not possessed by all workers.

Furthermore, it is certain that the pair analysis method used by Craig et al. has led to the detection of only a small proportion of the genetic variability in *A. aegypti*, since its sole aim was to discover conspicuous morphological changes in the adult stage. The larval stages were not examined, but it is highly probable that the visible mutants are less numerous than the non-visible ones (lethal genes, semi-lethal genes, sterility genes and those which speed up or retard development).

However this may be, the biological plasticity of the species has been confirmed. In some populations, there were at least two visible mutants hidden in each pair. Thus, each mosquito carried a gene for a hidden morphological trait and, no doubt, a series of genes for physiological and developmental characteristics. On the basis of a few random samples taken from wild populations it may be assumed that selective pressure acts against the accumulation of recessive mutants and that the latter have less chance of surviving in nature than under laboratory conditions.

A. aegypti apparently has a higher biological plasticity than some other mosquitos and seems to possess a genetic structure different from that of the *Culex* and *Anopheles* populations studied so far. In the *A. maculipennis* complex, for example, there are populations which are morphologically indistinguishable but reproductively isolated. In *A. aegypti*, on the contrary, the morphological differences do not appear to be accompanied by incompatibility and the three forms are interfertile.

The genetic resiliency of *A. aegypti* explains and governs its biology. The species is widespread all over the world, occupies a large variety of habitats, and has been able to adapt itself to many kinds of domestic situation.

What may be expected from this species in the future ? Thanks to its powers of adaptation and its genetic plasticity, it can install itself in different areas. It can probably bring into play defence mechanisms other than those which it has so far used against the chlorinated hydrocarbons. The discovery in Trinidad, in 1959, of numerous specimens of the form characterized by tree-hole breeding, which was thought to be restricted to the Ethiopian region or at least rare in the Western Hemisphere, is disquieting. Any widespread propagation of these open-air forms will have a damaging effect on the results of the *A. aegypti* eradication campaigns being conducted in the subtropical zone against the domestic forms (practically the only ones covered by spraying operations). The various forms of *A. aegypti* may also differ in their vector power; this is one of the potential dangers of the plasticity of the species.

The repercussions of this genetic adaptability on control methods are evident, for the same methods cannot be used to combat both homogeneous and highly variable populations. Genetically based techniques might be applied against these mosquitos and the insects themselves used for their own destruction. In this respect the males carrying the dominant male-producing factor would be useful weapons. If these males were bred in the laboratory on a large scale and then released into field populations, the sex ratio of the latter would probably undergo a spectacular fall in the proportion of females, with fatal results for the species. In the same way, specimens carrying lethal genes might be released into field populations. These techniques of autodestruction are now being studied.

A. aegypti is also an excellent subject for fundamental studies of genetic mechanisms. It is simple to breed in the laboratory, has a high reproductive potential and low chromosome number (three pairs), and puts a rich store of marker genes at the disposal of the entomologist.

INTERNATIONAL WORK IN CHOLERA *

4. The principles of control

In spite of the vast increase in international travel that has taken place during the last three or four decades, the spread of cholera —once a world-wide scourge—has been controlled so successfully that for more than ten years the disease has been confined to the endemic areas of India and Pakistan and a few neighbouring territories. Even here there has been a marked improvement, and in 1959 the situation in India was probably the best on record. For the whole of Asia, fewer than 42 000 cases of cholera were officially reported in 1959, compared with about 98 000 in 1958, 64 000 in 1957, and 242 000 in 1953.

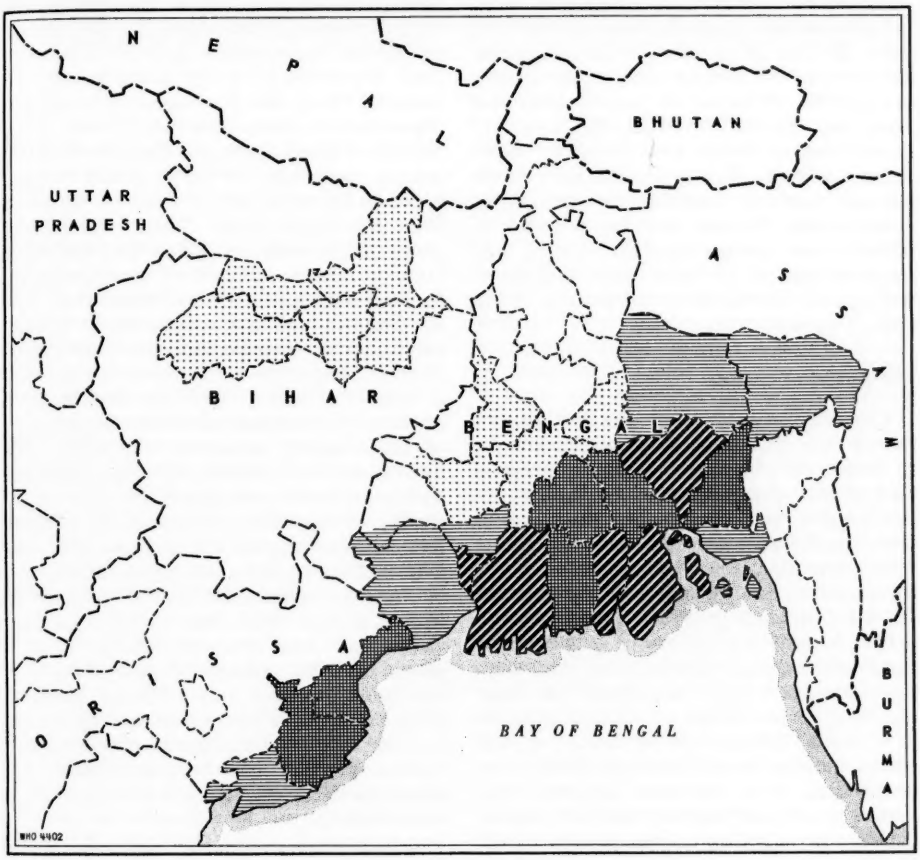
This remarkable achievement would not have been possible without close international co-operation based upon sound epidemiological principles. The beginnings of such international co-operation were made at the first International Sanitary Conference, held in Paris in 1851. Twenty years earlier, cholera had reached western Europe for the first time in history, and in 1831 a violent epidemic in Paris prompted the setting up of an official commission to investigate the epidemiology of the disease. The report published by this commission contained 67 detailed statistical tables analysing cholera deaths by age, sex, duration of the disease, atmospheric temperature, locality, exposure, elevation, soil humidity, population density, social class and occupation, and other factors. Even more elaborate studies were undertaken by Farr in England during the 1848-49 cholera epidemic, as well as by other workers, but the great mass of data accumulated threw little light on the factors involved in the spread of cholera. When the first International Sanitary Conference met, therefore, there was considerable dissension among members regarding the measures to be taken against cholera, and some delegates even opposed its inclusion on the agenda. A committee appointed to settle the matter decided that quarantine measures for cholera were " impossible and illusory, dangerous even in certain cases, and contrary to the purpose for which they were intended ". Notwithstanding this ruling, the convention finally drawn up by the conference did provide quarantine measures for cholera. Although these provisions were in some respects much stricter than those of the International Sanitary Regulations now in force, they largely failed in their purpose through the neglect of other factors. An understanding of these factors did not come until Koch established the infective nature of the disease and further epidemiological studies uncovered the principal routes by which the infection is disseminated.

The home of cholera

Although nearly all parts of the world have at some time been affected by cholera epidemics, it is only in India and East Pakistan that permanent endemic foci are known to exist. Rogers (1921) believed that cholera was also endemic in parts of the East Indies, southern China and the Philippine Islands, and possibly also in Iran, Arabia and South-East Russia, but more recent studies have shown that these are only secondary foci where cholera may become temporarily entrenched, perhaps for two or three years. While it is impossible to demarcate the endemic areas precisely, the principal regions of high endemicity are to be found in the delta area of Bengal at the lower reaches of the Hooghly river and around the confluence of the Ganges, the Brahmaputra and the Meghna; higher up the Ganges endemic foci appear to be present in Bihar, around the junction with the Sone,

* This is the fourth in a series of articles intended to give a concise account of the public health aspects of cholera and to outline present trends in its control. The first three articles in the series appeared in *WHO Chronicle*, 1961, 15, 3, 52, 99.

FIG. 1. AREAS OF HIGH CHOLERA ENDEMICITY IN INDIA, 1901-45



Endemicity rate per 1000 inhabitants

under 0.40	*0.60-0.79*	*1.00 and over*
0.40-0.59	*0.80-0.99*	

the Gandak and the Gogra, and in the United Provinces between Allahabad and the river Sone (see Fig. 1). Other foci have been described in the Brahmaputra valley in northern Assam, around the Mahanadi delta in Orissa, in the Cauvery delta in South Madras and perhaps also in the Godavari delta in North Madras.

All these endemic areas extend around rivers and none is more than 500 feet above sea-level; the climate is hot and humid, and the population is dense. One important consequence of these conditions is that the inhabitants are forced to draw their drinking water from surface water courses, since the water-logged nature of the land makes it

practically impossible to sink satisfactory wells and the provision of pipe-water would be prohibitively expensive in view of the technical difficulties. Standards of hygiene are low and the surface water courses serve not only for all household purposes but also often as sewers. Consequently they are grossly contaminated and liable to carry cholera vibrios. This is all the more likely because medical facilities for the rapid identification of cases and the isolation of patients are poor, especially during the frequent periods of high water and flood which disrupt communications and cut off the villages from the towns.

The spread of cholera

The discovery by Koch in 1883 of the role of the cholera vibrio [1] put an end to the controversy between the " contagionists ", who insisted that cholera was a highly contagious disease, and the " localists ", who maintained that local " miasmatic " factors were responsible for its appearance. However, it did not immediately settle the question of how the infection is conveyed from one person to another, nor was it known what local factors can, in fact, influence its spread. Since the organisms are found in large numbers in the stools of cholera patients it seemed highly probable that they are spread mainly, if not solely, by faecal contamination. For instance, persons who neglect proper washing or disinfection of the hands after attending cholera patients might contract the disease or pass it on to those with whom they come into contact. In general, however, cholera shows no tendency to spread in ordinary households, though it may become rampant where people are crowded together under particularly insanitary conditions. It does not seem, therefore, that contact infections play an important role in the epidemic spread of cholera, but they are believed to be largely responsible for the maintenance of the disease in sporadic form in the endemic foci.

Of much graver consequence is the dissemination of the infection through faecal contamination of food and drinking water. Convincing epidemiological evidence of the role of contaminated water in the spread of cholera had already been furnished by John Snow nearly thirty years before the isolation of the infecting agent. He showed that a violent local outbreak occurring in the vicinity of Broad Street, London, in 1854 and causing more than 500 deaths within 10 days could be traced to the consumption of water from the Broad Street pump. In another district of London, he found that the mortality in houses supplied with water drawn from a polluted part of the Thames river was 8-9 times as high as the mortality in houses supplied with water taken from higher up the Thames, where the river was free from the sewage of London. Striking confirmation of Snow's observations followed the opening of the Calcutta waterworks in 1870; the incidence of cholera in the city area, connected to the new water-supply, dropped by two-thirds, whereas the incidence in the suburbs remained unchanged. The presence of *V. cholerae* in drinking water was first demonstrated by Koch in India in 1884. The water came from a tank in which the linen of a cholera victim had been washed; of the 200-300 people using the same water for drinking and household purposes, 17 died of cholera. More recently, the presence of cholera vibrios in water supplies polluted with the dejecta of cholera patients has been confirmed on numerous occasions, using exact methods of identification.

Although contaminated water is most frequently a source of infection when drunk, it can also be a danger in other ways, for instance when incorporated in foods intended to be consumed cold, or when used for washing fruit and vegetables or for the cleaning of eating and cooking utensils. In some countries it is the practice to freshen up fruit and vegetables offered for sale by sprinkling them with water. Still more dangerous is the use of fresh night-soil as manure for lettuces or other vegetables destined to be consumed raw. Cold food and drinks may further become contaminated if offered for sale without protection against flies. It has been shown that flies which have

[1] See *WHO Chronicle*, 1961, 15, 52.

alighted on the dejecta of cholera patients or on contaminated linen are capable of infecting food for some hours afterwards, and there is ample evidence that they play a prominent role in disseminating the infection.

Fish are among the foods most often implicated in the spread of cholera because they easily become infected or contaminated if the water in which they live is polluted, and the organisms survive for a considerable time, or even multiply, inside them. Moreover, most shellfish, and in some countries other fish too, are usually consumed in a raw state.

It was at one time believed that a great variety of inanimate objects—so-called fomites—could serve as vehicles of cholera infection, and even letters sent from affected areas were carefully fumigated. While it is true that any objects in the immediate neighbourhood of the patient are liable to become contaminated, the vibrios do not survive longer than 24 hours on smooth surfaces owing to desiccation. On moisture-holding materials, such as cloth, the survival time may be considerably longer, so that clothes and bed-linen represent a potential source of infection. They can easily be sterilized, however, by boiling.

The role of carriers in the spread of cholera has been the subject of much controversy. In discussing this question, a distinction must be made between contact carriers, who harbour the infection but remain well, incubatory carriers, who subsequently develop the disease, and convalescent carriers. Observations made in China, India, Indochina and Ceylon over a period of many years do not indicate that contact carriers play a significant role in the spread of cholera.[2] Pollitzer considers that only " individuals late in the incubation stage, those actually ill, and possibly also those in early convalescence, are instrumental in spreading the infection ".

The rise and fall of epidemics

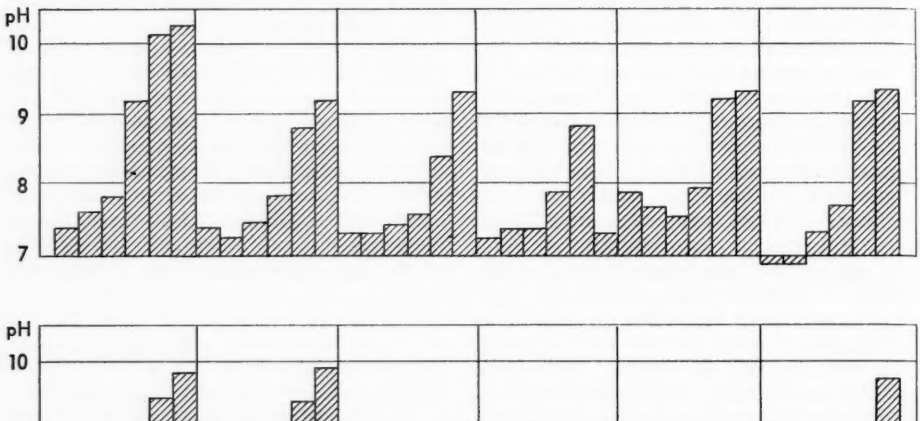
In order to control cholera successfully, it is important to know not only how the disease is passed on from one person to another but also what factors are responsible for the rise and fall of epidemics. Although it has long been recognized that climatic changes exert a profound influence on the incidence of cholera, temperature, humidity, rainfall and possibly other factors interact in a complex manner that is not yet completely understood. In spite of the fact that the cholera vibrio is more sensitive to heat than to cold,[3] it is almost invariably during the warm season of the year that cholera becomes epidemic, the incidence declining as the temperature falls. This is probably explained by the increased consumption of raw water, cold drinks, fruit, salads and other cold foods during hot weather. The greater prevalence of flies during the summer months is no doubt also an important factor. A high humidity appears to favour the spread of cholera, though whether the absolute humidity—as maintained by Rogers—or the relative humidity is decisive remains a matter of controversy. Rainfall may influence cholera incidence in various ways, depending apparently upon the preceding circumstances and the duration of the fall. Thus, occasional heavy downpours during a dry period will be likely to wash down infected faeces and other contaminated materials into the sources of water supply. More continuous rain, however, will dilute the infected material and eventually carry it away. Nevertheless, prolonged rain does not always inhibit the spread of cholera and in some areas epidemics have been known to continue or even to start during the wet season. Again, although desiccation is unfavourable for the survival of the vibrios, prolonged drought may create particularly dangerous conditions because the scanty water supplies become very heavily contaminated and people are forced to make use of them, however unpalatable or even repulsive they may be. Rogers has claimed that in India epidemics frequently occur in years following failure or deficiency of the monsoon rains, and he has pointed out, as an additional factor, that the deficient rainfall leads to widespread famine and that poor communications make it necessary to concentrate the starving people in large camps.

Very recently, an interesting theory has

[2] *Wld Hlth Org. techn. Rep. Ser.*, 1952, **52**, 9.

[3] See *WHO Chronicle*, 1961, **15**, 55.

FIG. 2. STUDIES OF pH CHANGES IN TWO VILLAGE WATER TANKS AT DACCA, EAST PAKISTAN, 1959



August 31	September 7	September 14	September 21	December 15	December 22
No rain, hot bright sun, early sunrise.	Rain in night and morning, cloudy-bright in afternoon.	Heavy rain preceding 4 days, cloudy, dull.	Heavy rain preceding 2 days, cloudy, dull.	No rain, bright sun, cool, late sunrise.	No rain, bright sun, cool, late sunrise.

The specimens were collected at 2-hour intervals, starting at 5.30 a.m.

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been put forward by Cockburn & Cassanos.[4] They have found that the pH of the village water tanks varies with the amount of sunlight owing to the photosynthetic activity of certain algae. In the mornings, the pH is usually around 7.0, but during sunny weather it rises to 10.0 or even 10.5 during the afternoon. During the monsoon, however, when there is little sunshine and the water is muddied and diluted by the heavy rain, this rise does not occur and the pH may even fall below 7.0 (see Fig. 2). It is well known that the cholera vibrio is able to tolerate a degree of alkalinity that is rapidly fatal to other intestinal organisms [5] and it is suggested by the authors that this property represents an adaptation by natural selection to the high alkalinity of the tanks during summer afternoons. It would enable the cholera vibrio to multiply at the expense of more sensitive

[4] Cockburn, T. A. & Cassanos, J. G. (1960) *Publ. Hlth Rep. (Wash.)*, 75, 791.

[5] See *WHO Chronicle*, 1961, 15, 52.

organisms and might thus help to explain the appearance of epidemics during hot, dry weather with plenty of sunshine and their disappearance during the rainy season.

In any study of the epidemiology of cholera, it is impossible to neglect the role played in the past by religious festivals and pilgrimages. The two largest festivals in India are the Kumbh and Ardh-Kumbh fairs, held alternately at Hardwar and Allahabad. One or other of these fairs takes place every three years, attracting 2-3 million persons at Allahabad and half a million to a million persons at Hardwar. Altogether about 400 fairs are held annually in the former United Provinces (now Uttar Pradesh), attended by a total of over 12 million people, while in Madras State there are more than a thousand festival centres. Other important fairs are held in Bihar and in Bombay State, and are often attended by pilgrims from neighbouring states. Many of these fairs are held at the time when climatic conditions are most favourable to the spread of cholera, which is further facilitated by such customs as drinking the sacred waters in which the pilgrims also bathe. Moreover, the returning pilgrims disperse in all directions, and any infection they carry is disseminated over a wide area. Still more notorious than the pilgrimages and fairs of India is the Mecca Pilgrimage, which played such an important role in the vast pandemics of the nineteenth century.[6] However, modern sanitary measures have rendered these fairs and pilgrimages completely innocuous as a means of spreading cholera.

While such mass movements of populations have played a major role in the origin and spread of epidemics in India and the Eastern Mediterranean countries, the extension of cholera to other areas has been effected mainly by traders and ordinary travellers. The arrival of a single infected traveller in a country where conditions were favourable to the spread of the infection has sufficed in the past to spark off an epidemic of disastrous proportions. In the earlier pandemics, when communications were slow, the infected person was not able to travel very far before the disease took hold of him. Where he was forced to arrest his journey, a new focus of infection started and from there other travellers carried the disease farther afield. As a rule, therefore, the epidemics extended in a series of relatively short relays. With the coming of the railways, long-distance leaps became possible, and it is perhaps significant that in India cholera epidemics suddenly became much more frequent in the Punjab following the opening up of railway communications in 1861. It is reassuring, however, that in general neither the railways nor air travel appear to have led to a rapid spread of the disease. This is no doubt due to the excellent international sanitary precautions now observed.

Even in the absence of public health measures to arrest the spread of the infection, cholera epidemics naturally tend to decline after several months. This can often be attributed in part to climatic changes, such as a fall in temperature or the onset of the rainy season. There is also evidence that a herd immunity gradually develops during the course of the epidemic, people who have once been infected remaining immune to further infection for some months, even if they did not show clinical signs of the disease. Some observers believe that the state of immunity may last for several years; Pollitzer thinks it likely that the duration of immunity varies according to a number of circumstances. In practice these natural mechanisms will be reinforced by the measures taken by the health authorities to isolate patients, improve the water supplies, control the sale of potentially dangerous foods and drinks, and educate the public in the precautions to be observed.

There can be no doubt that much more could still be learned about the various factors governing the rise and fall of epidemics if large-scale epidemiological studies were instituted to discover exactly how each patient contracted the infection, but it is doubtful whether the results would justify the enormous expense involved. The most exhaustive statistical studies conducted so far have been those published by Russell & Sundararajan in 1928. Their conclusions,

[6] See *Chron. Wld Hlth Org.*, 1957, **11**, 337.

summarized in the following statement, are still valid today:

> "The association of high relative humidity with high temperature, accompanied by intermittent rains, forms the most favourable atmosphere for the development of the disease. The presence of endemic centres from which epidemics spring at short intervals is also a fact which must be accepted. No single factor, however, can be held responsible for the periodic waves of the disease... and it must be recognized that these waves are preceded by conditions too complex to admit of complete solution with the aid of available data. Individual susceptibility, foci of infection, favourable atmospheric conditions, fairs and festivals, carriers, insanitary habits, all play their part in a manner which defies analysis."

Environmental sanitation

The ideal way to avert the threat of recurrent epidemics of cholera would obviously be to eliminate the endemic foci. From the above epidemiological considerations it follows that this is largely a question of improved environmental sanitation—the provision of an adequate supply of safe water for the populations in the endemic areas, and the adoption of modern methods of sewage disposal. For practical purposes, attention may be concentrated on the towns and cities, since in rural areas the spread of the infection is naturally limited by the relatively sparse population. By far the largest and most important city concerned is Greater Calcutta. Situated in the centre of the main endemic focus of West Bengal, it has a population of 5 000 000, with an average density of over 18 000 persons to the square mile. It covers some 30 municipalities, scattered along either side of the Hooghly River for a distance of some 40 miles upstream from the City of Calcutta itself. Since the Second World War, rapid industrialization and an explosive increase in population have resulted in a marked deterioration in the sanitary situation. The system for the supply of filtered river water, installed in 1870, has never been extended and supplies only a limited area. Even here, the supply is available only for a few hours in the morning and again in the evening. People therefore rely very much on unfiltered water, which is freely available over a large area day and night from a second pipe system laid in 1874. In addition, water is obtained from surface water courses, tanks, or shallow wells, often situated in close proximity to the latrines.

Only two-thirds of the city area is covered by a sewerage system; the remainder has service privies, emptied once a week or less often. Flies therefore abound during the pre-monsoon season, conveying infection from the excreta to food exposed for sale in open shops or on street stands, or peddled by hawkers. Moreover, owing to the absence of proper drainage, storm water easily finds its way into the privies, afterwards contaminating nearby shallow wells and surface water courses.

The complete modernization of the water supply, sewerage and drainage systems of Greater Calcutta will be a tremendous undertaking costing millions of dollars. First, there will have to be rapid extension of the system of piped, filtered water or provision of tube-wells to all areas, so that safe water can be supplied in ample quantity to all persons. The early safeguarding of the Hooghly River as a source of filtered water is essential. It has already shown an alarming increase in salinity and it is likely that this source of water will soon become unusable for weeks at a time unless the river receives fresh water discharges from other sources during the dry months. It has been estimated that by 1981 an average of 330 million gallons of water a day will probably be required. If a continuous 24-hour service at adequate pressure is to be maintained it will therefore be necessary to conduct a geological survey for sources of underground water. Plans for such a survey have already been made.

Parallel with these developments, the supply of unfiltered water should gradually be suppressed entirely. At the same time, the sewerage system will need to be extended to all areas, so that service privies and other objectionable excreta disposal procedures can be dispensed with. The provision of drainage facilities adequate to cope with maximum quantities of storm water is also

highly desirable. It will not be at all easy to raise sufficient funds to put all these measures into effect sufficiently rapidly to keep pace with the growth of population. The effort will be well worth while, however, for improvements in environmental sanitation in Greater Calcutta and other towns could lead not only to the elimination of the endemic foci and the eradication of cholera but also to a great reduction in the incidence of other gastro-intestinal infections. The rapid growth of Calcutta shows every sign of continuing and it promises to become one of the world's greatest seaports. Its international prestige and importance will be heightened tremendously if it can also boast a modern water supply and modern sanitation.

PERIODONTAL DISEASE

Although it is common knowledge that gingivitis can lead to loss of teeth, for most people " dental disease " is almost synonymous with " dental caries ". This attitude is reflected in the training of dentists, which has been concentrated on operative and prosthetic dentistry, while the diagnosis and treatment of disease of the structures supporting the teeth have been largely neglected. In the dental schools of the USA, for example, the time devoted to the teaching of periodontology during 1958 averaged 83 hours—only 2.1% of the total curriculum. Yet surveys made by the American Dental Association indicate that, in men over the age of 35 and women over the age of 40, periodontal disease is responsible for 2-3 times as many extractions as dental caries. In North American populations, the periodontium showed some sign of disease in nearly every adult examined, and evidence of gross and extensive tissue destruction was present in about half those still retaining some teeth at the age of 50 years. As far as can be judged from available data, the prevalence and severity of periodontal disease in most other parts of the world are at least as great as in North America.

With the aim of focusing world-wide attention on the importance of this problem, WHO last year convened a meeting of an Expert Committee on Dental Health [1] to review present knowledge of the subject and suggest how the control of periodontal disease should be attempted. In the introduction to the Committee's report [2] it is pointed out that " the damage caused to the supporting structures of the teeth by periodontal disease in early adult life is irreparable, whilst in middle adult life it destroys a large part of the natural dentition and deprives many people of their teeth long before old age ". This state of affairs is by no means inevitable, however: if the public could be persuaded to seek early dental care and follow advice on prevention, the prevalence of periodontal disease and the severity of its sequelae could be considerably reduced. Intensive dental health education is therefore the key to the control of this neglected disease.

The periodontium

Understanding of the disease processes is facilitated by a thorough knowledge of the periodontium, defined as " all the elements supporting the tooth, represented by cementum, the periodontal membrane, the alveolar bone, and the gingiva ". Other terms, such as " parodontium ", are also in use to describe these periodontal structures; although this difference in nomenclature is not serious, the adoption of a unified terminology would obviously be desirable.

Between the gingiva and the tooth there is an invagination of the epithelium which fits closely around the tooth forming the gingival crevice. It is in this crevice that periodontal

[1] Members of the Committee: Dr R. D. Emslie, United Kingdom (Rapporteur); Professor A.-J. Held, Switzerland; Dr Jarmil Kostlán, Czechoslovakia (Vice-Chairman); Dr A. L. Russell, USA (Chairman); Professor K. L. Shourie, India; Dr Sayed Sweilim, United Arab Republic. Secretariat: Professor B. Cohen, United Kingdom (Consultant); Dr F. Bruce Rice, WHO (Secretary); Dr L. Verhoestraete, WHO; Professor Jens Waerhaug, Norway (Consultant).

[2] *Wld Hlth Org. techn. Rep. Ser.*, 1961, 207.

disease usually commences. Unfortunately, neither the relationship between the epithelial invagination and the tooth nor the nature of the vital processes taking place in the gingival crevice has been clearly established.

The periodontal fibres, which make up the periodontal membrane by which the tooth is suspended in its socket, are attached to the cementum of the root. This consists of collagenous fibres and mineral salts, but here again little is known about the vital processes that take place in it and whether they are of any significance in the development of periodontal disease.

The periodontal membrane is richly supplied with blood vessels. During chewing, these act as a kind of hydraulic shock absorber: blood is squeezed out of the vessels by the pressure on the tooth, but at the same time the capillaries offer considerable resistance by reason of their small diameter. There is thus a pump-like action, increasing the blood flow to meet the requirements of increased function. Chewing also stretches and strengthens the fibres of the periodontal membrane and may slightly influence their orientation. Excessive pressure on the teeth, sufficient to damage the periodontal membrane, leads to circulatory disturbances and resorption of the alveolar wall.

Course of the disease

In general, local rather than systemic factors appear to be responsible for initiating periodontal disease. However, since the formation and maintenance of collagen are dependent on an adequate intake of vitamin C, any deficiency of this vitamin will favour inflammatory destruction of the collagen fibres, so that the deepening of a pre-existing periodontal pocket will take place more rapidly than usual. Other vitamin deficiencies, hormonal disturbances, and some protein deficiencies and blood dyscrasias may also influence the course of periodontal disease, but their effects are less spectacular than those of lack of vitamin C.

The most important single etiological factor is undoubtedly the deposition of bacterial plaque. This consists mainly of living micro-organisms, and although these are usually considered to be non-pathogenic they are present in high concentration. Moreover, as the organisms multiply, the plaque tends to grow below the gingival margin towards the apex of the tooth and is thus constantly in contact with a large area of soft tissue. The irritation produced by the bacteria and their toxins invariably leads to degeneration of the crevicular epithelium with inflammation of the adjacent connective tissue and formation of a pathological pocket in the gingival crevice. The apical spread of the bacterial plaque is opposed by the activity of the polymorphonuclear leucocytes and other defence mechanisms. If these mechanisms are not sufficiently powerful, the plaque may reach the apex of the tooth well within a normal life span.

Often the visible part of the gingiva may appear normal, in spite of severe inflammation in the connective tissue close to the tooth. However, the exudation of pus, composed of polymorphonuclear leucocytes, tissue fluid and epithelial cells, is a sure sign of the presence of subgingival plaque or calculus. The inflammatory reaction is accompanied by progressive destruction of the periodontal fibres and resorption of the alveolar wall. This loss of supporting structures is a permanent one and may progress to the point where the tooth falls out.

The deeper layers of the bacterial plaque often degenerate and become calcified to form calculus or tartar, which is firmly attached to the tooth. Supragingival calculus, if excessive, causes gingival recession and eventual loss of the tooth. Subgingival calculus has an irritating action which aggravates the inflammatory reaction produced by the bacterial plaque. Moreover, the surface of the calculus is often rough and may cause direct trauma to the soft tissues during mastication.

Apart from the inflammatory forms of periodontal disease (gingivitis, periodontitis), the periodontium may also be subject to degenerative changes or it may be the site of neoplastic processes. The Committee decided, however, to confine its attention to the inflammatory diseases, since these are not

only by far the most common but also the most readily preventable and treatable.

Prevention and treatment

Periodontal disease does not usually affect the very young, although the onset may be as early as puberty in susceptible persons. The prevalence and severity increase with increasing age, and in later life the disease causes much distress.

Since the damage caused by periodontal disease is irreparable, preventive measures should be instituted early in life. The aim must be to prevent the accumulation of bacterial plaque and to ensure healthy development of the periodontal structures, so that they are able to resist infection should it occur. Diet is of twofold importance: a correctly balanced diet for the pregnant mother and the growing child will contribute to normal growth and development of the periodontium, while the inclusion in the diet of raw, fibrous foods helps to clean the teeth and gingiva during mastication. It is particularly important to provide an adequate intake of proteins and vitamins and the correct quantity and ratio of mineral salts. Raw, fibrous foods not only clean the teeth but also cause considerable wear (attrition) which compensates for the continual eruption of the teeth. If the diet consists mainly of soft, pappy foods, this effect is lacking, with the result that the clinical crowns of the teeth gradually increase in length. Thus the stagnation areas for bacterial plaque and calculus around the gingival margins become farther apart and less subject to the self-cleaning action of mastication. There is also an increased risk of occlusal trauma with longer teeth.

To prevent the accumulation of bacterial plaque and the formation of calculus, the teeth and gums should be brushed after every meal, or at least twice a day. This also helps to stimulate the blood supply and increase keratinization of the gingiva. It is important that a correct technique should be used to ensure efficient cleaning and avoid injury to the gums. The mouth should be thoroughly rinsed with plain or flavoured water after tooth-brushing to remove loosened debris. Tooth-brushing and mouth rinsing are rarely sufficient to remove debris from between the teeth, however, and for this purpose it is usually necessary to use interdental sticks, elastic bands, or dental floss, particularly where there is evidence of inflammation or recession of the papillae.

Ideally every person should pay regular visits to the dentist, preferably every six months, for examination of the teeth and periodontium. On these occasions, any deposits of calculus that have formed since the previous visit should be removed with proper instruments and a check made for incipient disease. Thorough scaling and polishing of the teeth and the maintenance of perfect oral hygiene by the patient are the essentials of effective treatment, but in advanced cases, surgical operations on the gums, selective tooth grinding, or the fitting of special appliances may also be necessary.

Another responsibility of the dentist is to prevent or correct over-crowding of the teeth and malocclusion. Instanding or outstanding teeth interfere with natural or artificial cleaning, increase stagnation of debris, and are often associated with gingival recession. A further consequence may be lack of lip-seal, resulting in mouth-breathing. The absence of the diluting and cleansing effect of saliva tends to favour bacterial action, while the debris dries on the teeth and becomes more difficult to remove. In some types of malocclusion, the gingiva may be damaged by the teeth of the opposing jaw, or excessive pressure between opposing teeth (occlusal trauma) may aggravate existing periodontal disease.

Badly designed dental restorations and improperly fitted prosthetic or orthodontic appliances may also be of etiological significance in periodontal disease. The dentist should ensure that the restorations maintain the normal contour of the teeth and provide adequate contacts between them. Overhanging or rough edges, which favour stagnation of bacterial plaque, should be avoided or corrected. Removable appliances should be fitted in such a way that they leave the

gingival margins free and, if they have to be worn at night, they should be taken out frequently for cleaning.

Not all the above measures will be readily applicable in every country. The correction of faulty dietary habits is a slow process, even where suitable foods are available. Improvement in oral hygiene should, however, be within the reach of all populations, and in this sense the prevention of periodontal disease is largely a personal responsibility; the main tasks of the public health authority are therefore to educate the public in preventive measures and to provide an adequate dental health service.

The dental hygienist

An Expert Committee on Auxiliary Dental Personnel convened by WHO in 1958 [3] stressed the importance of the dental hygienist, working either under the close supervision of a dentist in private practice or as part of a public health team. Among the functions she can undertake are: the cleaning of teeth; the removal of calculus; and individual and group instruction in oral hygiene. The widespread use of dental hygienists would thus appear to be a practical and relatively inexpensive method of controlling periodontal disease. Classes of schoolchildren can be given instruction by the dental hygienist in the technique of oral hygiene, preferably with the aid of models, slides and films. At the same time, advice can be given on the types of food that are good for gingival health and when to eat them. The chewing of raw, cleansing foods at the end of meals should be especially recommended. Children who fail to profit from group instruction, as revealed on routine inspection of the mouth, should be given individual instruction and a check made on their performance with the toothbrush. Polishing the children's teeth to remove stains is a vital adjunct to this teaching, but scaling is not usually necessary until adolescent or adult life.

The removal of supragingival calculus by scaling and subsequent polishing plays an important part in the treatment of all forms of periodontal disease, as well as in prevention, and it can be done just as efficiently by a dental hygienist as by a fully trained dentist. In chronic periodontal disease, it is essential that subgingival calculus should also be removed. This is a tedious and time-consuming procedure, but one in which the dental hygienist can become very proficient. The treatment of patients with subgingival calculus or with acute gingivitis should always be under the supervision of a dentist or periodontal specialist. The dentist should likewise prescribe the particular techniques of tooth-brushing and interdental cleaning to be taught to each patient by the hygienist.

The report of the Expert Committee on Dental Health recommends that dental hygienists should be attached to nurseries, child welfare centres, schools, factories, dental clinics in hospitals, and the private clinics of dental surgeons. Their use represents a saving in time and money and is rendered all the more necessary by the world-wide shortage of dentists. At the same time, the Committee considered it essential to increase the numbers of fully qualified personnel and to effect radical changes in the curriculum of most dental schools; " it seems " states the report " highly desirable that separate departments and chairs of periodontology be established in all dental schools and that increased time be devoted to this field in both clinical and preclinical courses."

Research

Further information is badly needed on the etiology and epidemiology of periodontal disease. This calls for long-term population studies on a comparatively large scale, particularly in areas where the prevalence and severity of periodontal disease are unusually high or unusually low and where a variety of etiological factors may be in operation. Several population indices have been designed for comparing the prevalence and severity of periodontal disease in different populations. The so-called " reversible index ", based on an estimate of the amount of active

[3] *Wld Hlth Org. techn. Rep. Ser.*, 1959, **163**; see also *WHO Chronicle*, 1959, **13**, 185.

disease present at a given time, is more generally useful than the " irreversible " type, based on total tissue damage over the lifetime of the individual. The report analyses the value of a number of the most widely used indices and recommends the Periodontal Index developed by the United States Public Health Service to cover both gingivitis and periodontitis as being easy to determine and giving results of high comparability. In any particular study, however, the choice of index will depend upon the type of information desired and the conditions under which the survey is made. Indices are badly needed for such factors as traumatic occlusion, for which no population data are at present available.

One of the problems most in need of study is why periodontal disease is more prevalent in certain ethnic groups than in others. It has been suggested that this is due to a hereditary predisposition, but some recent surveys have thrown doubt on this hypothesis. The report suggests that WHO should sponsor epidemiological investigations designed to throw light on this question; the possible etiological significance of certain other factors, such as nutrition, dietary habits, and systemic disease, might be conveniently assessed at the same time.

NURSING IN THE EASTERN MEDITERRANEAN REGION

The first regional seminar on nursing to be held in the Eastern Mediterranean Region took place, under the auspices of WHO and the Government of Pakistan, in Lahore, West Pakistan, from 23 November to 3 December 1960. It was attended by 28 nurses and nursing administrators from 10 countries, 9 international observers from institutions such as the United Nations Children's Fund (UNICEF), the United Nations Relief and Works Agency for Palestine Refugees (UNRWA), the US International Cooperation Administration (ICA), the International Council of Nurses (ICN), and the American University of Beirut, and 11 WHO staff members.

The main theme of the seminar—introduced by Elizabeth Hilborn, Chief Nurse, ICA, Addis Ababa [1]—was " comprehensive nursing care ". This was defined in the fourth report of the WHO Expert Committee on Nursing as including " all of the aspects of teaching, counselling, guidance, curative and preventive care, and mobilization of family and community resources for the solution of health problems ".[2] This type of care is a return to the warm personal care of the patient as given by the old village nurse, but reinforced by modern concepts of public health and of social, medical, and other sciences. It involves intimate contact with the patient, his family, and the community for the promotion of health, the prevention of disease, and the cure of sickness. The nurse who provides this type of care has a unique opportunity and, indeed, the obligation to be a friend, supporter, counsellor, and health teacher, as well as a trained technician. While she is not a psychiatric social worker, a sanitary engineer, or a community development specialist any more than she is a physician, she has certain knowledge and skills in common with each of these workers. Because of her unique position in the health team, she is often the best agent for bringing the needs of the patient, his family, and his community to the attention of her co-workers. Comprehensive nursing care can be given by a nurse with a sound knowledge of good health practices and of nursing skills, sensitivity to the needs and problems of the people and to their readiness to accept help, and ability to see and use everyday opportunities for giving such help.

The question of training for comprehensive nursing care was discussed by the seminar. It was considered that continuous and well-planned recruitment and publicity pro-

[1] Unpublished working document EM/Nurs.Sem./3.

[2] *Wld Hlth Org. techn. Rep. Ser.*, 1959, 167.

grammes should be organized, and the selection of candidates improved through frequent study and revision of admission requirements aimed at a gradual upgrading of standards and the introduction of effective interviewing and screening procedures and of aptitude tests. The basic nursing curriculum —it was suggested—should also be revised to include an early introduction to the nurse's responsibility for the promotion of health and the prevention of disease; to use actual cases as well as textbooks as source material in the teaching; to include training in social studies and psychology; to give scope for training for leadership; to arrange for effective correlation of classroom teaching and clinical practice and for co-operative planning between school and service staff, while encouraging the establishment of schools as autonomous institutions.

The seminar also considered the scope of nursing service and trends in nursing in the Eastern Mediterranean Region, the participants providing summaries of the nursing situation in their respective countries. It was evident that considerable progress has been made in nursing in the Region over the past ten years; in fact, about two-thirds of the 90 schools for training nurses in the Region were set up during that time. This progress is largely due to advances in general education programmes, the more active participation of women in public life, and the increased interest of the public in nursing. In recent years, nursing sections have been established within the ministries of health of some of the countries represented, nursing associations have been formed, and nursing legislation established. In all the countries represented, professional nurses have been playing an active part on committees and in conferences and surveys relating to their profession.

Nursing education programmes are similar throughout the Region, usually including basic professional education, training programmes for auxiliary nursing personnel, midwifery education at the professional and auxiliary levels, post-basic programmes in public health nursing, administration and teaching, and special clinical courses in tuberculosis, psychiatric, and ophthalmic nursing. In one country a pre-nursing course is given, and in two countries there are training courses for community nurses, who give public health and midwifery services in rural health centres.

It was suggested that the shortage of nursing personnel should be relieved by training well-qualified nurses to educate and supervise others; by training a larger number of auxiliary nursing personnel to work under the supervision and guidance of professional nurses; by the use of all available personnel, including married nurses who could be employed on a part- or full-time basis; by the reassignment of duties that keep the nurse from the bedside; and by the allocation of non-nursing tasks to other than nursing personnel.

Other topics discussed by the seminar included: the role of the nurse as a member of the health team; the administration of nursing services; policy-making on a national level affecting nursing education and nursing service. The participants also heard an account of the history, aims, functions, and activities of the International Council of Nurses.

The main recommendations of the seminar may be summarized as follows: nursing divisions within national ministries of health should be strengthened or established; each country should make a careful study of nursing resources and needs with a view to the registration of nurses and, eventually, the establishment of nursing legislation; each country should form a national nurses' association representing all qualified nurses in the country and aim at its recognition by the International Council of Nurses; individual countries should, with technical advice from WHO, organize nursing seminars or meetings, at which nursing, medicine, education, the social sciences and similar disciplines should be represented; nursing education programmes in each country should be constantly evaluated, revised and improved to provide the comprehensive nursing care needed for the country's expanding health services: a WHO-assisted post-basic course for the training of nurse

educators should be established on a regional level; a committee should be formed under WHO auspices to compile data on nomenclature in nursing; and refresher courses for nurses with long service should be established by WHO on a regional level.

Notes and News

Executive Board: twenty-seventh session

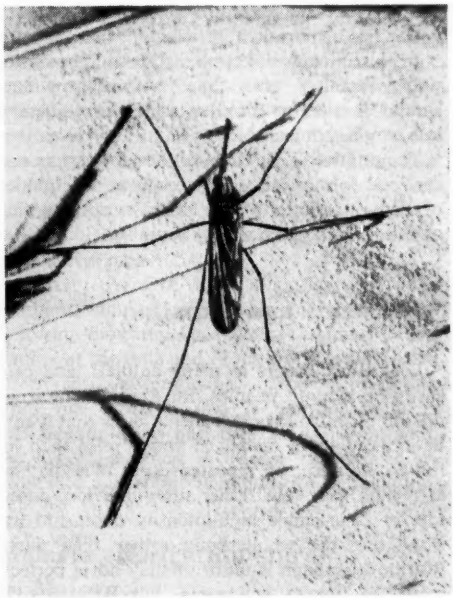
The Executive Board of WHO met for its twenty-seventh session at Vigyan Bhavan, New Delhi, from 30 January to 2 February 1961, shortly before the opening of the Fourteenth World Health Assembly. The Chairman was Dr H. M. Penido, the Vice-Chairmen were Dr V. N. Butrov and Dr A. O. Abu Shamma, and the Rapporteurs Dr L. Molitor and Dr J. A. Schandorf.

The majority of the matters discussed by the Board were subsequently examined by the World Health Assembly, and the Board recommended a number of resolutions for adoption by the Assembly. Concerning WHO assistance to the Republic of the Congo (Leopoldville), the Board expressed its belief "that the measures taken by the Director-General in the field of the Organization's responsibilities and within the limits of its resources are to be commended", and thanked the International Committee of the Red Cross, the League of Red Cross Societies and contributing governments for their part in this operation. The Board also heard reports from the Organization's Regional Directors on the 1960 sessions of the various Regional Committees, and approved publication of the reports of a number of expert groups convened by WHO.

It was decided to hold the twenty-eighth session of the Board in the Palais des Nations, Geneva, commencing on 29 May 1961.

Contact of mosquitos' legs with insecticides

The weight of a resting mosquito is not distributed evenly over its six legs. This fact is of some importance in malaria eradication, since residual insecticides are picked up by insects' legs and the amount absorbed depends on the size of the contact area. Tests with *Anopheles* on surfaces treated with DDT and dieldrin are described in an article shortly to appear in the WHO Bulletin.[1]



A. atroparvus *at rest.*

It was found that the contact of the forelegs with the resting surface is small, only the claws touching the insecticide. The middle legs have more contact, but the hind legs bear most of the insect's weight, usually asymmetrically. This is shown by the photograph, in which several

[1] Ungureanu, E., Crismaru, V. & Burghele, E. (1961) *Bull. Wld Hlth Org.*, **24** (In press).

tarsal segments of the left hind leg are in contact with the surface, whereas the right hind leg touches it at only one point. These observations were confirmed by removing different pairs of legs from anaesthetized mosquitos. The removal of the forelegs had little effect on mortality from the insecticide. After the removal of the hind legs, however, the median lethal concentration was nearly double that for insects with all legs intact, and four times that for insects with the front legs removed.

The movements of the mosquito on the treated surface increase the number of contacts and the quantity of insecticide absorbed. This is why the differences, after the removal of various pairs of legs, were less marked for dieldrin than for DDT, which has a more irritant effect.

In insecticide susceptibility tests, therefore, only mosquitos which have not lost any legs should be used, so that the results with different lots may be comparable.

The relative importance of the hind legs is not confined to mosquitos. Research on the uptake of colouring matter by the legs of various species of insects have given similar results.[2]

Leukaemia and radiation

Leukaemia occurs in many animals, and can easily be induced in mice, for example, by irradiation. Controlled experiments show that it can be induced more readily in young mice than in full-grown mice, by repeated doses of radiation at a high dose-rate rather than at a low dose-rate or by a single high-intensity dose, and by irradiating the whole body rather than part. Murine leukaemia is unfortunately not a perfect model of human leukaemia, but it does give some hints about the kind of radiation that might cause leukaemia in man; for example, cases of human leukaemia that have probably been induced by radiation have followed high dose-rates. Whether the incidence of leukaemia is markedly increased after therapeutic radiation of a limited area of the soft tissues in the human being still remains to be determined, however; but a study being sponsored by WHO may now help to provide answers to this type of question.

[2] Gratwick, M. (1957) *Bull. ent. Res.*, **48**, 741.

WHO is greatly interested in the effects of radiation on the human body and has brought together a number of special study groups to examine specific aspects of the subject. One of these, the Scientific Group on Radiobiology, recommended a study of the incidence of leukaemia in patients treated with radiation for cancer of the cervix, and a meeting of investigators was held in Geneva on 1-2 September 1960 to work out final plans.

The aim of such a study is not only to determine the incidence of leukaemia after radiation treatment for cancer of the cervix, but also to determine variation in the incidence as a function of the time elapsing after exposure, and (if an increased incidence is found) to relate the findings to those of other studies and assist, if possible, in the further elucidation of the dose-response relationship between exposure to radiation and the incidence of leukaemia at these relatively high exposure levels. To fulfil these aims a large number of patients are required, and only by the collaboration of clinics in many different countries can a sufficient number be obtained. Accurate estimates of radiation exposure and careful follow up of individuals after exposure are also required, and these too require close co-operation between institutions.

How can such a study best be carried out? The proposal approved by the investigators is that all patients with carcinoma of the cervix seen during a period of five years in the collaborating clinics should be kept under observation. They will be seen at six-monthly intervals, and samples of their peripheral blood will be taken for full haematological examination. A co-ordinating centre will receive and evaluate the data and prepare draft reports that will go to all collaborators before publication.

The project is now under way, with assistance from WHO. Some of the collaborating clinics cannot take part in the study immediately, but they will join in at various dates as individual circumstances permit.

Comparative leukaemia studies

The leukaemias or lymphosarcomas and allied conditions are among the commonest neoplasms of domestic animals and in certain respects close-

ly resemble the leukaemias of man. Intensive epidemiological and etiological studies of these conditions can possibly throw a great deal of light on the problem of human leukaemias. There is an abundance of material for epidemiological studies of animal leukaemias in slaughter houses, farms, and veterinary clinics. Accurate breeding records of many herds are available for genetic studies of certain factors. Moreover, experimental studies are much easier to carry out in animals than in humans.

It has been observed that bovine leukaemias are commoner in certain areas in northern Europe than in many other parts of the world. This situation lends itself to studies on the environmental, genetic and other factors involved. Also, there is some evidence suggesting a recent increase in the incidence of bovine leukaemia in the USA and in parts of Europe. Studies are being planned in the USA to ascertain whether there is any correlation between this apparent increase and high natural background radiation. Various workers have reported the isolation of infectious agents, presumably viruses, causing leukaemias in animals. If substantiated, their findings could have a bearing on the problem in man.

A comparative study of animal and human leukaemias is thus of great interest in human oncology. To stimulate interest in this important field of research and to co-ordinate studies already being conducted in different countries, WHO convened a conference of medical and veterinary investigators of leukaemias, in Philadelphia, from 27 February to 4 March 1961. Its aim was to review present knowledge in this field and to ascertain the most fruitful lines of research, in particular those requiring international co-ordination by WHO. Technical criteria were laid down for special investigations on such aspects as diagnosis, epidemiology, transmission, virology, etc.

Leukaemias of cattle and dogs figured prominently in the discussions, because of their similarities to those of humans, and because work on them has hitherto been scattered and uncoordinated. The condition known as leukosis of poultry, which has certain special features distinguishing it from the disease in mammals, was discussed separately, mainly from the epidemiological point of view. Murine leukaemias were not covered, as the subject has already received a great deal of attention.

Risks of non-attenders in mass tuberculosis campaigns

In assessing the results of mass tuberculosis campaigns, it is important to determine whether those who have not taken part suffer from the disease to a markedly different extent from those who have. This aspect was discussed in a recent number of the WHO Bulletin [1] with respect to the Danish campaign of 1950-52.

In the 15-34 age group, amounting to 778 074 persons, of whom 64.1% were participants, the incidence of tuberculosis was 1.6-1.9 times greater among the non-attenders over the four years following the campaign and as much as 2-3 times greater in the first year. A careful study of the factors involved excluded the likelihood that this inequality might be explained by social or other differences between the two groups (though such existed) or by any difference in previous BCG vaccination rates.

It seems probable that the considerably lower morbidity among participants during the years following the campaign was the outcome of case-finding at the time and of mass BCG vaccination afterwards. A reasonable practical deduction from this work is that if the non-attenders had actually taken part they would have shared the lower incidence of disease experienced by those who did submit themselves for examination.

Malaria eradication starts in Malaya

Of Malaya's 6.5 million inhabitants, an estimated 3.5 million live in malarious areas. A recent survey showed that the proportion of Malay children infected with the disease varies between 27% and 46%. Since 1901, the chief antimalaria weapon in Malaya had been the drainage and oiling of streams and canals to kill the mosquito larvae. This method was expensive and difficult to maintain, but it was successful in

[1] Horwitz, O. & Knudsen, J. (1960) *Bull. Wld Hlth Org.*, 23, 669.

urban areas and on some rubber estates. It helped to wipe out the disease in Singapore, but transmission continued in rural communities.

Early last year the Government of Malaya decided to undertake an eradication campaign with help from WHO. A WHO advisory team, composed of a malariologist, an entomologist and a sanitary engineer, has been in the country since June 1960 to prepare for the campaign and to train local technicians and spraymen. Spraying started in February of this year in a pilot project area of 400 sq. miles where some 130 000 people live under the threat of malaria. The campaign will be co-ordinated with similar campaigns in neighbouring countries through the Antimalaria Co-ordination Board, which is composed of representatives from Burma, Cambodia, Laos, Malaya, Thailand and Viet-Nam.

Distribution of endemic goitre

Dr D. A. Baird, Director of Medical Services, Sarawak, has made the following comments on the article "World distribution of endemic goitre" which appeared in the September 1960 number of *WHO Chronicle* (Vol. 14, No. 9).

It is stated in this article (p. 343) that in Sarawak "many of the people are protected from goitre by consumption of an iodine-rich salt derived from natural salt springs". Dr Baird says: "The fact of the matter is that out of a total population in Sarawak of 744 391 as determined at the recent census, only between 2000 and 2500 people are protected from goitre as described above. It must however be explained that a very considerably greater number of people belonging to the same race as those referred to but living in Indonesian Borneo (Kalimantan) are also protected, not so much because they have their own sources of supply but because they are known to trade with the Sarawak people thus obtaining iodine-rich salt supplies which protect them from the disease."

Dr Baird also observes that "the endemic goitre map which appears opposite page 339 shows what was until recently British Somaliland as an endemic goitre area ... I served for 5½ years in the capacity of Director of Medical Services in British Somaliland during which time I travelled extensively but I cannot recall ever having seen a case of endemic goitre."

International architectural competition for new PAHO building

The Pan American Health Organization (PAHO) has announced an international architectural competition to select a design for a new PAHO headquarters building in Washington, D.C. The competition will be limited to architects of the Americas. The winning architect will be awarded the building contract. The second prize will be $2500, and the third $1000.

The winning design will be picked by a jury consisting of four internationally known architects and of Dr Abraham Horwitz, Director of the Pan American Sanitary Bureau, which acts as the WHO Regional Office for the Americas, as well as being the administrative office of PAHO. The architects are: Héctor Mardones-Restat, Chile, President of the International Union of Architects; Luis González Aparicio, Mexico, Past President of the Society of Mexican Architects; Augusto Guzmán Robles, a leading Peruvian architect; and Samuel Inman Cooper, Atlanta, Ga., President of the Pan American Congress of Architects and a Fellow of the American Institute of Architects. The new headquarters, which will be built on land donated by the US Government, is expected to cost approximately $4.5 million.

Architects interested in obtaining more information about the competition should write to PAHO's professional adviser, Leon Chatelain, jr, Fellow and Past President of the American Institute of Architects, 1632 K Street N.W., Washington 6, D.C.

Registration for the competition closes on 8 May 1961. The conditions of competition have been approved by the International Union of Architects and the American Institute of Architects.

People and Places

Health of seafarers

The Brussels Agreement of 1924 provides for the free treatment of venereal diseases in seafarers, regardless of nationality, in the principal sea and river ports of the contracting countries. It is thus an international health service in a limited communicable disease field. This was pointed out by a WHO Study Group,[1] which met in Oslo in 1956 and recommended that the health facilities granted to seafarers under the Agreement be extended to cover eventually a wider range of health problems, and that a survey be made by WHO of seafarers' health problems in ports and of the health facilities generally available to them. A WHO Expert Committee on Venereal Infections and Treponematoses that met in 1959 [2] was of the opinion that the health of seafarers could best be safeguarded by defining anew and periodically reviewing the implications of the Brussels Agreement in the light of recent medical progress, and by assessing its usefulness through a survey of its functioning in the principal sea and river ports of Member States of WHO, through consultant studies, and through yearly returns from governments adhering to the Agreement. The technical definitions of "venereal infections" and the interpretation of the Agreement, the minimum requirements for practice and equipment in ports and at sea, and an appraisal scheme for the functions of the Agreement were endorsed by the Thirteenth World Health Assembly in Geneva in May 1960.

Consultant services are accordingly being made available by WHO for the study of the working of the Agreement in different ports. Thus, Dr A. Perdrup, Director of the Dermato-venereological Services, Copenhagen Municipality, Denmark, has been assigned by the Organization to visit several ports in France, including Marseilles, Bordeaux, Rouen and Dunkirk; and Dr G. McElligott, of Ireland, Consulting Physician to St Mary's Hospital and previously Venereal Disease Adviser to the Ministry of Health, London, is visiting ports in Italy, including Genoa, Palermo, Trieste and Naples. In 1960, another WHO consultant, Dr A. Hutchinson, explored the general health conditions and facilities for treatment of seafarers in ports in Greece, Egypt, India, Singapore, Philippines, Hong Kong, Japan, USA and Canada. The findings of these consultants will be included in a report to be presented by the Director-General to the World Health Assembly in 1962.

[1] *Wld Hlth Org. techn. Rep. Ser.*, 1958, **150**.

[2] *Wld Hlth Org. techn. Rep. Ser.*, 1960, **190**.

Tuberculosis adviser for Western Samoa

After having almost wiped out yaws, Western Samoa is now intensifying its campaign against tuberculosis with the aim of ultimately eradicating the disease. Dr Eung Soo Han, of the Republic of Korea, has been assigned by WHO to help the Western Samoan health authorities in this task. During this assignment he will be working with national public health experts and medical teams thoroughly trained in disease control in the territory's recently concluded yaws campaign. Owing to its isolated position in the South Pacific, the territory is free from plague, malaria, cholera and smallpox, but there are about 500 new cases of tuberculosis there every year.

Dr Eung Soo Han holds a medical degree from Severance Medical College, Seoul, Korea, and has carried out postgraduate research in the USA. His last post in the Republic of Korea was that of Director, National Institute of Health, Ministry of Health and Social Affairs. He has been a member of Korean delegations to various World Health Assemblies and to the WHO Regional Committee for the Western Pacific.

New Area Representative in Taipeh

Dr A. H. Penington, WHO medical officer in the tuberculosis control programme in Western Samoa, has been appointed Area Representative of the Organization for China (Taiwan), Hong Kong, Japan, Korea, Macau, the US Trust Territory of the Pacific Islands, Guam, and the Ryukyu Islands.

As Area Representative, Dr Penington will represent Dr I. C. Fang, Director of the WHO Regional Office for the Western Pacific, in the co-ordination of international health work in his area. He will be stationed in Taipeh, Taiwan. He will also represent Dr Fang in negotiations with

governments on technical and administrative questions in connexion with international health work. The WHO area office in Taipeh was established in July 1959. Other WHO area offices in the Western Pacific Region are in Sydney, Singapore and Saigon.

Dr Penington obtained his medical degree from the University of Melbourne, Australia. He was Medical Director of Central Hospital, Melbourne, from 1945 to 1947, consultant on chest diseases in the Repatriation Commission, Commonwealth of Australia, from 1947 to 1956, and WHO medical officer in the tuberculosis control programme in Taiwan from 1956 to 1960.

Development of community water supplies

As part of its programme for the world-wide development of community water supplies, WHO is offering governments the services of engineers, sanitation experts, and legal advisers. To help speed up the programme in the Western Pacific Region, Mr J. Arbuthnot was recently appointed sanitary engineer in the environmental sanitation section of the WHO Regional Office in Manila.

Mr Arbuthnot studied civil engineering at the University of Kansas and sanitary engineering at Harvard University. After serving for six years as assistant engineer in the Kansas State Department of Health, he joined WHO as sanitary engineer assigned to Ethiopia, subsequently serving with the Organization in Egypt, Lebanon, East Pakistan, Ceylon, and India. Just before his transfer to the Western Pacific Region, he was WHO senior adviser for a sanitation project in the State of Uttar Pradesh, India.

Bilharziasis in India

Dr Louis J. Olivier has been loaned by the US Public Health Service to the South-East Regional Office of WHO to work with Indian specialists on a study of bilharziasis in India. Human schistosome infection is known to occur in Gimvi, Ratnagiri, south of Bombay, and special attention will be paid to this focus.

Dr Olivier is Acting Chief, Laboratory of Parasitic Diseases, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Md.

Research on cardiovascular diseases

For international studies on cardiovascular diseases to be comparable, standardized nomenclature and methodology are essential.

Dr A. M. Burgess, research associate attached to the Department of Preventive Medicine, Harvard University, has been appointed to study this problem at WHO headquarters from February 1961.

A graduate of Harvard Medical School, Dr Burgess has since 1947 been a consultant on cardiology and internal medicine at various hospitals in New England.

Leprosy control

Dr F. Hemerijckx has been appointed WHO leprosy adviser to the Government of India for the development of a WHO/UNICEF-assisted leprosy control programme which is to start this year.

Dr Hemerijckx worked as a leprologist in the Belgian Congo for more than twenty years. In 1956, he started a leprosy control project financed by the King Leopold Memorial Foundation in Polambakkam, Madras State, India, a district with one of the highest leprosy prevalence rates in the country. During this project, which has now been taken over by the Indian Government, several thousand leprosy patients were brought under ambulatory treatment, and it has demonstrated the feasibility of carrying out an inexpensive mass leprosy campaign under the conditions prevailing in India.

PASB appointment

Dr John C. Cutler, of the US Public Health Service, was recently assigned to serve as Assistant Director of the Pan American Sanitary Bureau (PASB), which acts as the WHO Regional Office for the Americas.

Dr Cutler has been attached to the US Public Health Service for eighteen years, during which he has held a number of research, teaching, and administrative posts in the United States and elsewhere. His previous outside assignments have included the organization of a WHO-assisted public health demonstration and training programme in India.